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14. ABSTRACT The 2016 Fall Meeting of the Materials Research Society was held in Boston, MA during November 27 to December 2, 2016. The world's foremost international scientific gathering for materials research, the MRS meeting showcases leading interdisciplinary research in both fundamental and applied areas, coordinated by over 200 scientists from both academia and industry in many countries around the world. This meeting encouraged networking and scientific exchange and facilitated symposia that were interdisciplinary, highlighting cutting-edge topics in materials research and technology.					
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Final Technical Report – Materials for Biointegrated Photonic Systems (BM5)

Objectives

The objective of the grant is to promote participation of junior researchers at the “Materials for Biointegrated Photonic Systems” symposium at the MRS Fall 2016 Meeting and encourage publication of high-quality original research in the field of biophotonics by providing merit-based poster-presentation awards to selected students and postdoctoral researchers.

Highlights

The symposium provided an excellent opportunity for the participating students/postdocs to learn about the latest scientific breakthroughs, disseminate their own research findings, and network with other researchers in the field. Selected student/postdoc awardees also participated in the symposium invited speaker appreciation dinner (supported by MRS funds), which furnished an opportunity for them to communicate face-to-face with leading scientists in the biophotonics field. The symposium participants we had interacted with were unanimously satisfied about the quality of technical presentations as well as the breadth of topics covered in the symposium.

Contributions to discipline

Presentations in the symposium covered a number of exciting latest advances in the field of biophotonics. The symposium featured invited and contributed speakers whose expertise spans multiple mainstream and emerging biophotonic technologies. The attached Table 1 summarizes the invited speakers in the symposium, which represents the breath of the topics coverage in the symposium. The symposium included 40 technical presentations (including 13 invited talks) and a poster session.

Through bringing together scientists and engineers specializing in the biophotonics field, the symposium provided a unified forum to foster cross-disciplinary discussions and collaborations. The symposium also contributed to expanding the material repertoire for next-generation biophotonic systems, and promoted participation of junior researchers in materials and biophotonics research.

Future directions for this topic

Several future research directions received particular emphasis based on the technical presentations in the symposium. For example, the field of mechanically flexible photonic system for biological integration was highlighted in multiple invited and contributed talks as these devices start to transition from pure laboratory curiosity to a useful tool in biomedical research. Multifunctional photonic integration on such platforms at a system level also received significant interest. Enhanced mechanical and photonic properties imparted by synergistic micro-mechanical and photonic co-design were spotlighted in several talks.

Another area of considerable interest is the development of novel multifunctional materials for integrated biophotonic systems, including nanoparticles, polymers and biological materials. These

materials not only exhibit unique optical functions for light manipulation, but can also be engineered to carry biological functionalities (such as functioning as engineered tissue scaffold).

Summary of those supported with ARO funds

The student/postdoc awardees along with their presentation titles and affiliations are listed below. Each awardee was presented with a \$600 travel grant.

- “Origin of the Observed Photoluminescence Enhancement from Conjugated Polymer Thin Films on Nanoporous Silver Nanomembranes,” Zeqing Shen, Rutgers University
- “Nanoimprinted SeRs sensors for chemical and biological detection,” Guinevere Strack, University of Massachusetts Lowell
- “Transparent electronics and optoelectronics for neural imaging and ontogenetic applications,” Yei Hwan Jung, University of Wisconsin-Madison
- “Moisture Responsive Wrinkling Surface with Tunable Dynamics,” Zeng Songshan, University of Connecticut
- “Bendable, Stretchable and Multi-Functional Integrated Photonics,” Lan Li, Massachusetts Institute of Technology

Table 1. List of Symposium BM5 invited speakers and topics

Speaker	Affiliation	Presentation Topic
Polina Anikeeva	MIT	Optogenetic and magnetic neural interfaces
Amin Arbabian	Stanford University	Medical imaging devices
Wenlong Cheng	Monash University	Nanoparticle-based soft biophotonics
Ana Claudia	University of California, Berkeley	Printed organic electronic devices for biomedical applications
Nanshu Lu	University of Texas at Austin	Mechanics of biointegrated electronic and photonic devices
Jack Ma	University of Wisconsin-Madison	Nanomembrane electronics and photonics
Fiorenzo Omenetto	Tufts University	Silk-based bioelectronics
John Rogers	University of Illinois at Urbana-Champaign	Biointegrated flexible optoelectronics
Oliver Schmidt	IFW Dresden	Optogenetic hearing restoration
Yurii Vlasov	University of Illinois at Urbana-Champaign	Silicon integrated photonics for biomedical applications
Takao Someya	University of Tokyo	Flexible pressure sensors for tactile sensing
Xue Feng	Tsinghua University	Integrated plasmonic sensors
Weidong Zhou	University of Texas, Arlington	Nanomembrane photonics

SYMPOSIUM BM5

SESSION BM4.17: Neural Interfaces III

Session Chair: Nick Melosh
Friday Morning, December 2, 2016
Sheraton, 3rd Floor, Commonwealth

8:30 AM BM4.17.01

Surgically Implantable 3D Electrodes and Flexible Probes Enabled by Biodegradable Material Xiangbing Jiao and Quan Qing; Arizona State University, United States.

8:45 AM BM4.17.02

Pushing the Dimensional Limits of Implanted Neural Electrodes Xiaoling Wei¹, Lan Luan², Zhengtuo Zhao¹ and Chong Xie¹; ¹University of Texas at Austin, United States; ²University of Texas at Austin, United States.

9:00 AM BM4.17.03

Chronically Stable, Flexible Bio-Electronics for Brain and Heart Activity Mapping Hui Fang¹, Ki Jun Yu², Jianing Zhao², Enming Song², Christopher Gloschat³, Jonathan Viventi⁴, Igor Efimov³ and John A. Rogers²; ¹Northeastern University, United States; ²University of Illinois, Urbana-Champaign, United States; ³The George Washington University, United States; ⁴Duke University, United States.

9:15 AM BM4.17.04

Measuring Evoked Action Potential on Moving Muscle of Optogenetics Rat Using Organic Electro Chemical Transistors Wonryung Lee¹, Dongmin Kim¹, Jonathan Rivnay², Naoji Matsuhisa¹, Thomas Lonjaret², Tomoyuki Yokota¹, Hiromu Yawo³, Masaki Sekino¹, George G. Malliaras² and Takao Someya¹; ¹University of Tokyo, Japan; ²Ecole Nationale Supérieure des Mines, France; ³Tohoku University, Japan.

9:30 AM BM4.17.05

Thiol-Isocyanate Substrates for Durable, Softening Neural Interfaces Gregory Ellson, Romil Modi, Yousef Qattan, Tara Blair and Walter Voit; University of Texas at Dallas, United States.

9:45 AM BM4.17.06

Flexible Fibers for Optoelectronic Probing of Spinal Cord Circuit Chi Lu, Seongjun Park, Yoel Fink, Polina Anikeeva and Alex Derry; Massachusetts Institute of Technology, United States.

Materials for Biointegrated Photonic Systems

November 29 - November 30, 2016

Symposium Organizers

Roozbeh Ghaffari, MC10, Inc.
Juejun Hu, Massachusetts Institute of Technology
Giovanni Antonio Salvatore, Swiss Federal Institute of Technology in Zurich (ETHZ)
Xing Sheng, Tsinghua University

All journals in the MRS portfolio welcome submissions based on the individual presentations at the 2016 MRS Fall Meeting. Papers submitted and accepted for publication in MRS Advances (www.mrs.org/mrs-advances) will be available as collections of the symposia. Visit the MRS/Cambridge University Press Publications Booth #100 in the Exhibit Hall to learn more about MRS Advances, including print options available at special rates during the meeting week only.

* Invited Paper

SESSION BM5.1: Implantable Optical Systems

Session Chairs: Juejun Hu and Xing Sheng
Tuesday Morning, November 29, 2016
Hynes, Level 1, Room 104

8:30 AM *BM5.1.01

Materials for Thin, Flexible Near Field Wireless Optoelectronic Devices as Subdermal Implants for Broad Applications in Optogenetics John A. Rogers; University of Illinois, United States.

9:00 AM BM5.1.02

Intracellular Lasers—Real Time Tagging and Tracking of Live Cells with Optical Microresonators Marcel Schubert¹, Klara Volckaert¹, Markus Karl¹, Andrew Morton¹, Philipp Liehm¹, Gareth B. Miles², Simon J. Powis³ and Malte C. Gather¹; ¹University of St Andrews, United Kingdom; ²University of St Andrews, United Kingdom; ³University of St Andrews, United Kingdom.

9:15 AM BM5.1.03

Bioresorbable Active Materials for Organic Light-Emitting Devices Nils Juergensen^{1,2}, Johannes Zimmermann^{1,2}, Maximilian Ackermann³, Anthony J. Morfa^{1,2}, Tomasz Marszalek⁴, Felix Hinkel³ and Gerardo Hernandez-Sosa¹; ²Karlsruhe Institute of Technology, Germany; ²InnovationLab GmbH, Germany; ³Ruprecht-Karls-Universität Heidelberg, Germany; ⁴Max Planck Institute for Polymer Research, Germany.

9:30 AM BM5.1.04

Bio-Compatible Poly(lactic-co-glycolic acid) as Ion-Conducting Polymer in Light-Emitting Electrochemical Cells Johannes Zimmermann^{1,2}, Nils Juergensen^{1,2}, Anthony J. Morfa¹, Serpil Tekoglu^{1,2}, Bohui Wang^{1,2} and Gerardo Hernandez-Sosa^{1,2}; ¹Karlsruhe Institute of Technology, Germany; ²InnovationLab, Germany.

9:45 AM BM5.1.05

Persistent Negative Photoconductivity in Silk Protein Hydrogels Triggered by Metal Nanoparticles Narendar Gogurla, Arun K. Sinha, Subhas C. Kundu and Samit K. Ray; Indian Institute of Technology Kharagpur, India.

10:00 AM BREAK

10:30 AM *BM5.1.06

Transparent Electronics and Optoelectronics for Neural Imaging and Optogenetics Application Yei Hwan Jung¹, Dong-Wook Park¹, Hyungsoo Kim¹, Jihye Bong¹, Justin Williams² and Zhenqiang Ma¹; ¹University of Wisconsin-Madison, United States; ²University of Wisconsin-Madison, United States.

11:00 AM BM5.1.07

High Performance Solar Blind Photodetectors Based on N- and P-type Epitaxial β -Ga₂O₃ Fikadu Alema¹, Brian Hertog¹, Dmitry Volovik¹, Oleg Ledyayev¹, Grant Thoma¹, Ross Miller¹, Andrei Osinsky¹, Partha Mukhopadhyay², Sara Bakhshi², Haider Ali² and Winston V. Schoenfeld²; ¹Agnitron Technology, United States; ²University of Central Florida, United States.

11:15 AM BM5.1.08

Tumor Targeted CdSeTe Quantum Dots-Folic Acid-Doxorubicin for Bioimaging and Treatment of Cancer Kaushik Das¹, S.C. Aier², Archis Marathe¹, Ajithkumar Gangadharan³, Dhiraj Sardar³, Jun Jiao² and Jharna Chaudhuri¹; ¹Texas Tech University, United States; ²Portland State University, United States; ³University of Texas San Antonio, United States.

11:30 AM *BM5.1.09

Hybrid Flexible Membrane Multi-Band Imagers and Optical Membrane Sensors Weidong Zhou¹, Yuze Sun¹, Zhenqiang Ma², Laxmy Menon¹, Yonghao Liu¹, Hongjun Yang¹ and Deyin Zhao¹; ¹University of Texas at Arlington, United States; ²University of Wisconsin-Madison, United States.

SESSION BM5.2: Flexible and Stretchable Devices
Session Chairs: Roozbeh Ghaffari and Giovanni Antonio Salvatore
Tuesday Afternoon, November 29, 2016
Hynes, Level 1, Room 104

1:30 PM *BM5.2.01

Recent Progress of Ultraflexible Organic Photonic and Electronic Skins Takao Someya¹, Tomoyuki Yokota¹, Peter Zalar¹, Martin Kaltenbrunner², Hiroaki Jinno¹ and Naoki Matsuhisa¹; ¹University of Tokyo, Japan; ²Johannes Kepler University Linz, Austria.

2:00 PM BM5.2.02

An Ultrasensitive and Flexible Strain-Gauge Nanolaser Jae-Hyuck Choi, Jae-Pil So, Jung Min Lee, Kyoung-Ho Kim, Sehwan Chang, Soon-Jae Lee and Hong-Gyu Park; Korea University, Korea (the Republic of).

2:15 PM *BM5.2.03

Cut-and-Paste Manufacture of Transparent and Stretchable Epidermal Sensors Based on Large Area CVD Graphene Nanshu Lu; University of Texas at Austin, United States.

2:45 PM BM5.2.04

Multicolor Flexible Blade-Coated Polymer Light-Emitting Diodes (PLEDs) for Optoelectronic Sensors Donggeon Han, Jonathan Ting, Yasser Khan and Ana Claudia Arias; University of California, Berkeley, United States.

3:00 PM BREAK

3:30 PM *BM5.2.05

Ultrathin Gold Nanowires as New Electronic Skin Materials for Soft Electronics Wenlong Cheng; Monash University, Australia.

4:00 PM BM5.2.06

Bendable, Stretchable and Multi-Functional Integrated Photonics Lan Li¹, Hongtao Lin¹, YiZhong Huang¹, Junying Li¹, Jerome Michon¹, Shutao Qiao², Nanshu Lu², Carlos Ramos³, Laurent Vivien³, Anupama Yadav⁴, Kathleen Richardson⁴ and Juejun Hu¹; ¹Massachusetts Institute of Technology, United States; ²University of Texas at Austin, United States; ³University of Paris-Sud, France; ⁴University of Central Florida, United States.

4:15 PM BM5.2.07

A Photonic Crystal Embedded Hydrogel Platform for High-Throughput Screening of Large Microbial Libraries Producing Biofuels and Bioproducts Sukwon Jung, Joel L. Kaar and Mark P. Stoykovich; University of Colorado Boulder, United States.

4:30 PM BM5.2.08

Designing Tunable Bio-Inspired Visible-Light-Responsive Actuators and Their Intelligent Electromechanical Applications Jue Deng, Peining Chen, Longbin Qiu and Huisheng Peng; Fudan University, China.

4:45 PM BM5.2.09

Moisture Responsive Wrinkling Surface with Tunable Dynamics Songshan Zeng¹, Dianyun Zhang², Wenhan Huang^{3,1}, Andrew T. Smith¹, Stephan G. Freire¹, Vivian M. Garbellotto¹, Helen Nguon¹ and Luyi Sun¹; ¹University of Connecticut, United States; ²University of Connecticut, United States; ³Heyuan Polytechnic, China.

SESSION BM5.3: Poster Session
Session Chairs: Roozbeh Ghaffari and Juejun Hu
Tuesday Afternoon, November 29, 2016
8:00 PM - 10:00 PM
Hynes, Level 1, Hall B

BM5.3.01

Implosion Fabrication Samuel Rodrigues, Daniel Oran, Ruixuan Gao, Adam Marblstone and Edward Boyden; Massachusetts Institute of Technology, United States.

BM5.3.02

Nano-Imprinted SERS Sensors for Chemical and Biological Detection Michaela Fitzgerald^{2,1}, Junwei Su³, Guinevere Strack¹, Margery Pelletier⁴, Peter Gaines⁴, Hongwei Sun³, Pradeep Kurup² and Ravi Mosurkal¹; ¹US Army Natick Soldier RDEC, United States; ²University of Massachusetts Lowell, United States; ³University of Massachusetts Lowell, United States; ⁴University of Massachusetts Lowell, United States.

BM5.3.03

Optical Fiber Component Development toward Biointegrated Photonic Systems Jiauheng J. Wang; National Sun Yat-Sen University, Taiwan.

BM5.3.04

DNA-Directed Self-Assembly of Quantum Dots for FRET-Based Biosensor Se Yeon Choi¹, Jae Chul Park¹ and Yoon Sung Nam^{1,2}; ¹Korea Advanced Institute of Science and Technology, Korea (the Republic of); ²Korea Advanced Institute of Science and Technology, Korea (the Republic of).

BM5.3.05

Use of Curcumin as Fluorescent Probe for Biological Imaging—An Unexpected Photophysical Behavior Fernando H. Cristovan², Tatiane M. Arantes³, Thais Moraes Arantes⁴ and Erick Piovesan¹; ¹Instituto de Física, Brazil; ²Universidade Federal de São Paulo, Brazil; ³Universidade Federal de Goiás, Brazil; ⁴Instituto Federal Goiano, Brazil.

BM5.3.06

Origin of the Observed Photoluminescence Enhancement from Conjugated Polymer Thin Films on Nanoporous Silver Nanomembranes Zeqing Shen¹ and Deirdre O'Carroll^{1,2,3}; ¹Rutgers University, United States; ²Rutgers University, United States; ³Rutgers University, United States.

BM5.3.07

Monitoring Vital Signs with Flexible Organic Biophotonics Yasser Khan, Donggeon Han, Adrien Pierre, Jonathan Ting, Claire M. Lochner and Ana Claudia Arias; University of California, Berkeley, United States.

SESSION BM5.4: Soft and Implanted Systems
Session Chairs: Giovanni Antonio Salvatore and Xing Sheng
Wednesday Morning, November 30, 2016
Hynes, Level 1, Room 104

8:30 AM *BM5.4.01

Multifunctional Nanomembrane Microtube Devices Oliver G. Schmidt; Leibniz-Institut für Festkörper- und Werkstoffforschung, Germany.

9:00 AM BM5.4.02

3D Photonic Sensor-Integrated Tissue Model for Force Sensing Sarah Geiger¹, Jerome Michon², Aidan Zerdoum¹, Lan Li^{2,1}, Junying Li², Anupama Yadav³, Kathleen Richardson³, Juejun Hu² and Xinqiao Jia¹; ¹University of Delaware, United States; ²Massachusetts Institute of Technology, United States; ³University of Central Florida, United States.

9:15 AM *BM5.4.03

Multifunctional Fibers—Flexible Tools for Neural Tissue Interrogation Polina Anikeeva; Massachusetts Institute of Technology, United States.

9:45 AM BM5.4.04

High-Q Silk Fibroin Whispering-Gallery-Mode Microresonator for Thermal Sensing Linhua Xu^{1,2}, Xuefeng Jiang¹, Guangming Zhao¹, Ding Ma³, Tiger H. Tao^{4,5}, Zhiwen Liu³, Fiorenzoomenetto⁴ and Lan Yang^{1,2}; ¹Washington University in St. Louis, United States; ²Washington University in St. Louis, United States; ³The Pennsylvania State University, United States; ⁴Tufts University, United States; ⁵University of Texas at Austin, United States.

10:00 AM BREAK

10:30 AM *BM5.4.05

Miniaturized Medical Implants Powered with Ultrasound [Amin Arbabian](#); Stanford University, United States.

11:00 AM BM5.4.06

Energy Transport Processes within Peptide-Based Self-Assembled Nanomaterials [John D. Tovar](#); Johns Hopkins University, United States.

11:15 AM BM5.4.07

Water Vapor-Induced Iridescent Color Change of Nanocoatings [Jingjing Liu](#), Songshan Zeng, Thomas D. D'auria, Andrew T. Smith, Arup Choudry, Thais d. Vieira and Luyi Sun; Institute of Materials Science, United States.

11:30 AM BM5.4.08

Photocurrent Generations from Photosystem I Assembled on Nanostructured Surfaces [Dibyendu Mukherjee](#)^{2,3,1}; ¹University of Tennessee, United States; ²Nano-BioMaterials Laboratory for Energy, Energetics & Environment (nbml-E3), United States; ³Sustainable Energy Education and Research Center (SEERC), United States.

11:45 AM BM5.4.09

3D Scaffold Fabrication with Inverse Photolithography [Ozlem Yasar](#) and Ramesh Prasad; City University of New York, United States.

SYMPOSIUM BM6

Fabrication, Characterization and Applications of Bioinspired Nanostructured Materials
November 28 - December 1, 2016

Symposium Organizers

Hendrik Hoelscher, Karlsruhe Institute of Technology (KIT)
Mathias Kolle, MIT
Ullrich Steiner, Adolphe Merkle Institute
Silvia Vignolini, University of Cambridge

Symposium Support

Nano

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* Invited Paper

SESSION BM6.1: Bioinspired Material Interfaces and Surfaces for the Control of Wetting I
Session Chairs: Alon Gorodetsky and Hendrik Hoelscher
Monday Morning, November 28, 2016
Hynes, Level 2, Room 200

8:30 AM *BM6.1.01

SLIPSERS—When a Pitcher Plant Meets SERS Shikuan Yang, Birgitt B. Stogin, Xianming Dai and [Tak Sing Wong](#); The Pennsylvania State University, United States.

9:00 AM BM6.1.02

A Bioinspired Liquid-Repellent Material with Switchable Slippery and Superhydrophobic Functions [Yu Huang](#), Nan Sun, Birgitt B. Stogin, Jing Wang, Shikuan Yang and Tak Sing Wong; The Pennsylvania State University, United States.

9:15 AM BM6.1.03

How Water Advances on Superhydrophobic Surfaces [Frank Schellenberger](#) and Noemi Encinas; MPI for Polymer Research, Germany.

9:30 AM BM6.1.04

Fabrication and Dynamic Wetting Properties of Bioinspired, Three-Dimensional Hierarchical Wrinkles [Won-Kyu Lee](#)¹ and Teri W. Odom^{1,2}; ¹Northwestern University, United States; ²Northwestern University, United States.

9:45 AM BM6.1.05

Tunability of Infused Polymers as Immobilized Liquid Layer Substrates [Caitlin Howell](#)^{1,2}, Irini Sotiri^{2,3} and Joanna Aizenberg^{2,3}; ¹University of Maine, United States; ²Harvard University, United States; ³Wyss Institute, United States.

10:00 AM BREAK

10:30 AM *BM6.1.06

The Role of Hard Nanofibers in Frog's Soft Adhesive Microstructures [Aranzazu del Campo](#) and Longjian Xue; INM-Leibniz Institute for New Materials, Germany.

11:00 AM BM6.1.07

Synthetic Butterfly-Inspired Scale Surfaces with Tunable Compliance and Anisotropic Droplet Adhesion [Hangbo Zhao](#), Sei Jin Park, Brian Solomon, Sanha Kim, Adam T. Paxson, Yu Zou, Kripa Varanasi and A. John Hart; Massachusetts Institute of Technology, United States.

Final report

MRS Symposium BM6

Fabrication, Characterization and Applications of Bioinspired Nanostructured Materials

2016 Materials Research Society Fall Meeting, Boston, MA

compiled by Mathias Kolle, MIT

1. Symposium summary

In this symposium, we successfully emphasized the four different key aspects in the field of bio-inspired nanostructured materials that are currently at the focus of the scientific investigations of top-class interdisciplinary researchers around the world:

- 1) Bio-inspired and Bio-derived Design and Applications of hierarchical, multifunctional, adaptive, stimuli-responsive materials,
- 2) Novel approaches for the fabrication and characterization of functional biological and bioinspired materials,
- 3) Bio-inspired material interfaces and surfaces for the control of wetting, adhesion, and other functions,
- 4) Bioinspired optics and photonics, and
- 5) Biomineralization.

2. Highlights

A line up of excellent invited speakers who highlighted their work and who spearhead our rapidly advancing research field included (in alphabetical order):

- **Gianluca Farinola**, Professor at the University of Bari, Italy:
“Smart Nanomaterials from Diatoms Microalgae and Functional Organic Molecules”
- **Alon Gorodetsky**, Assistant Professor at the University of California, Irvine:
“Dynamic Materials—From Cephalopods to Shapeshifters”
- **Niels Holten Andersen**, Assistant Professor at MIT:
“Bio-Inspired Metal-Coordination Dynamics—An Easier Way to Engineer Supramolecular Mechanics”
- **Derk Joester**, Associate Professor at Northwestern University:
“Chemical Nanotomography of Interfaces and Interphases in Tooth Biominerals”
- **LaShanda Korley**, Associate Professor at Case Western Reserve University:
“Inspired by Nature—Scalable Fabrication of Functional Fiber Scaffolds and Fiber-Reinforced Hydrogels”

- **Raul Martin-Palma**, Professor at the University of Madrid, Spain:
“Surface Texturing at the Micro- and Nano-Scales by Laser Techniques for the Control of Cell Adhesion and Migration”
- **Fiona Meldrum**, Professor at the University of Leeds, UK:
“Controlling Crystallization Using Confinement—A Bio-Inspired Approach”
- **Fiorenzo Omenetto**, Professor at Tufts University:
“Biopolymer Based Technological Interfaces”
- **Kyoo-Chul Park**, Assistant Professor at Northwestern University: “Combining Lessons from Three Different Species to Design a New Material for Water Condensation”
- **Vinodkumar Saranathan**, Assistant Professor, National University Singapore:
“Biomimetic Potential of Self-Assembled Biophotonic Nanostructures”
- **Stoyan Smoukov**, Lecturer at the University of Cambridge: “Unconventional Routes to Smart Materials”
- **Christoph Weder**, Professor at the University of Fribourg, Switzerland:
“Bio-Inspired, Mechanically Adaptive and Adapting Polymer Systems”
- **Diederik Wiersma**, Professor at the University of Florence, Italy:
“Photonic Arms, Legs and Skin”
- **Tak Sing Wong**, Assistant Professor at Pennsylvania State University:
“SLIPSERS—When a Pitcher Plant Meets SERS”

Half of our selection of invited speakers were junior faculty, who are considered the next generation of thought leaders in their respective areas within the expanding field of biologically inspired materials.

With the ARO grant, we were able to offer travel support for all junior faculty amounting to \$300.

Contributed talks, a significant portion given by graduate students, provided insight into a rich variety of projects that define specific avenues in our field. Exemplary are the following contributions by graduate students:

- Seth Cazzell, MIT:
“The Role of Hydroxide and Metal Concentration on the Mechanical Properties of Metal Coordinated Gels”
- Giulia Giudetti, University of Cambridge:
“Cellulose-based Multifunctional Photonic Structures”

- Seung Yeol Lee, Korea Advanced Institute of Science and Technology: “Anisotropic Photonic Spheres with a Gradient of Structural Colors for Multi-Coloration”
- Vivian Merk, ETH Zürich: “Oriented Crystallization of Barite in Hierarchical Biomaterial”
- Jifei Ou, Media Lab MIT: “Method of 3D Printing Micro-Pillar Array on Surfaces”
- Zachary Ruff, University of Cambridge: “DNA-Colloidal Gels with Tunable Pore Sizes Showing Structural Color”
- Joseph Sandt, MIT: “Tunable Elastomeric Photonic Fibers for Colorimetric Determination of Applied Pressure in Compression Therapy”
- Felix Vüllers, Karlsruhe Institute of Technology: “Bioinspired Highly Transmissive Superhydrophobic Films for Optical Applications”
- Michael Whittaker, Northwestern University: “Enhanced Properties through Non-Equilibrium Compositions—A Biomineralization Approach”
- Hangbo Zhao, MIT: “Synthetic Butterfly-Inspired Scale Surfaces with Tunable Compliance and Anisotropic Droplet Adhesion”

Support by the ARO allowed us to provide a travel support to all graduate student oral presenters amounting to \$100 each.

Both poster sessions of our symposium were well attend. With the support from the ARO we were able to offer four poster prizes to honor the following outstanding contributions:

- Hortense Le Ferrand, ETH Zürich: “Periodically Microstructured Bio-Inspired Composites with On-Demand Energy Dissipation Properties”
- Santosh Kumar Misra, University of Illinois at Urbana-Champaign: “Bio-Inspired Nano-CarboScavengers for Rehabilitation of Petroleum Contaminated Water”
- Krithika Ramchander, MIT: “Water Filtration Using Naturally-Occurring Membranes in Plant Xylem”
- Seunghyeon Baek, Pohang University of Science and Technology, Korea: “Bio-Inspired Superhydrophobic Surfaces for Enhanced Underwater Stability and Regenerative Drag Reduction Capability”

All four contributions were chosen from a large selection of excellent posters presented in our symposium and were awarded a certificate and \$150.



Left: Two of the poster prize winners (Ms. Hortense Le Ferrand, 2nd from left, Mr. Seunghyeon Baek, 3rd from left) together with two of the conference organizers (H. Hölscher, left and M. Kolle, right). Right: The certificates given to the poster prize winners together with their prize.

3. Contributions to the discipline

Our symposium at the 2016 MRS fall meeting captured the current state of the art in fabrication, characterization and applications of bioinspired nanostructured materials. It provided a platform for researchers across disciplines to exchange their newest insights into biological strategies for materials design, characterization of biological materials. In the symposium, we discussed the opportunities for fundamental science and applied research in bio-inspired materials.

On the fundamental side, this included

- phenomena at the molecular scale such as metal-coordination dynamics and advanced crystallization concepts,
- nano-and micro-scale processes, such as hydrogel-fiber composite design and self-assembly of functional optical materials, and
- the design of materials with dynamic properties, and advanced visualization techniques to gain insight into biological nano- and microscale interfaces.

Highlights on applied research included

- the design of materials with superior water harvesting abilities inspired by a synergy of different natural strategies,
- the demonstration of dynamic photonic actuators and machines, and
- a demonstration on how omni-repellent surfaces can be utilized to enhance surface enhanced Raman scattering-based detection methods.

With excellent invited speakers, a good mix of senior and junior faculty, and great contributed presentations, our symposium attracted material scientists and engineers,

biologists, physicists, chemists, and electrical and mechanical engineers. It was among the three largest symposia of the MRS meeting and represented a great framework to discuss the latest developments, challenges and opportunities the field of bio-inspired materials.

4. Future research directions

Research in biological and bio-inspired materials promises great paradigm shifts in materials science and engineering that will lead to novel strategies in materials design, fabrication, and characterization. This will form a platform for advanced technology development to address challenges of the 21st century in energy, food and water security, defense, communication, and sustainable product design. However, in order to understand and utilize the concepts, design rules, and processes that enable the formation of multifunctional biological materials, we need to foster and increase on the interdisciplinary collaboration of many research fields spanning from materials science and biology to chemistry, mathematics and physics. Challenges remain in understanding the biological, biomechanical, and biochemical processes underlying spatial and temporal structure and composition control across length scales. Nature exploits myriad combinations of composite materials, tailoring physical and chemical properties through control of morphology and composition to create materials with great functionality and dynamics. With new insights into nature's material design approaches and strategies to form bio-inspired dynamic materials that mimic the best of cephalopods, chameleons, fruits, plants, and insects, we are just beginning to break ground in understanding and rivaling the skills that some organisms show in controlling soft and hard matter. Beautiful lab-scale demonstrations of bio-inspired materials exist but more research is required to advance fabrication strategies that are amenable to industrial manufacturing. The next decades will show that nature can teach us many lessons, might provide the machinery to control and effectuate materials formation through unique biomanufacturing approaches, and ultimately help us to advance our technological proficiency in a sustainable fashion.

We hope that this dynamic, border-crossing and idea-sparking MRS session in the burgeoning area of bio-inspired materials science that was enabled in part by funding of the ARO will be followed by many more of this kind.

5. Summary of ARO funding use

Travel support for junior faculty:

Gorodetsky, Alon	\$300
Holten-Andersen, Niels	\$300
Joester, Derk	\$300
Korley, LaShanda	\$300
Saranathan, Vinodkumar	\$300
Wong, Tak Sing	\$300
Farinola, Gianluca	\$300
	\$2100

Travel support for graduate student oral presenters:

Alsharif, Nourin	\$100
Cazelli, Seth	\$100
Guidetti, Giulia	\$100
Islam, Mohammad	\$100
Kim, Hye-Na	\$100
Lee, Won-Kyu	\$100
Merk, Vivian	\$100
Middleton, Rox	\$100
Mittal Nitesh, Nitesh	\$100
Ou, Jifei	\$100
Regitsky, Abigail	\$100
Sandt, Joseph	\$100
Vueller, Felix	\$100
Whittaker, Michael	\$100
Wong, Min Hao	\$100
Wong, William	\$100
Zhang, Xiaolin	\$100
Zhao, Hangbo	\$100
Ruff, Zachary	\$100
	\$1,900

Poster awards:

Baek, Seunghyeon	\$150
Le Ferrand, Hortense	\$150
Misra, Santosh Kumar	\$150
Ramchander, Krithika	\$150
	\$600

\$515 were spend for the conference registration fee of Prof. Ling Li, Virgina Tech, who volunteered on short note as a replacement speaker stepping in for Aranzazu del Campo, Max Planck Institute for Polymer Research, who had to miss the meeting due to an unforeseen strike of Lufthansa pilots.

This amounts to a total of \$5115 of which \$4,675 were covered by the kind funding from the ARO.

6. Acknowledgement of ARO funding at the conference

Funding by the ARO was acknowledged by specific announcements made by the organizers to the audience at each symposium session and in the form of a slide displayed during all session breaks. The slide is shown in the image on the right.

2016 MRS[®]
FALL MEETING & EXHIBIT
November 27 – December 2, 2016 | Boston, Massachusetts

Symposium BM6
Fabrication, Characterization, and Applications
of Bio-inspired Nanostructured Materials

With financial support from

Organized by: Hendrik Hölscher, Silvia Vignolini, Ullrich Steiner, Mathias Kolle

10:00 AM BREAK

10:30 AM *BM5.4.05

Miniaturized Medical Implants Powered with Ultrasound [Amin Arbabian](#); Stanford University, United States.

11:00 AM BM5.4.06

Energy Transport Processes within Peptide-Based Self-Assembled Nanomaterials [John D. Tovar](#); Johns Hopkins University, United States.

11:15 AM BM5.4.07

Water Vapor-Induced Iridescent Color Change of Nanocoatings [Jingjing Liu](#), Songshan Zeng, Thomas D. D'auria, Andrew T. Smith, Arup Choudry, Thais d. Vieira and Luyi Sun; Institute of Materials Science, United States.

11:30 AM BM5.4.08

Photocurrent Generations from Photosystem I Assembled on Nanostructured Surfaces [Dibyendu Mukherjee](#)^{2,3,1}; ¹University of Tennessee, United States; ²Nano-BioMaterials Laboratory for Energy, Energetics & Environment (nbml-E3), United States; ³Sustainable Energy Education and Research Center (SEERC), United States.

11:45 AM BM5.4.09

3D Scaffold Fabrication with Inverse Photolithography [Ozlem Yasar](#) and Ramesh Prasad; City University of New York, United States.

SYMPOSIUM BM6

Fabrication, Characterization and Applications of Bioinspired Nanostructured Materials
November 28 - December 1, 2016

Symposium Organizers

Hendrik Hoelscher, Karlsruhe Institute of Technology (KIT)
Mathias Kolle, MIT
Ullrich Steiner, Adolphe Merkle Institute
Silvia Vignolini, University of Cambridge

Symposium Support

Nano

All journals in the MRS portfolio welcome submissions based on the individual presentations at the 2016 MRS Fall Meeting. Papers submitted and accepted for publication in MRS Advances (www.mrs.org/mrs-advances) will be available as collections of the symposia. Visit the MRS/Cambridge University Press Publications Booth #100 in the Exhibit Hall to learn more about MRS Advances, including print options available at special rates during the meeting week only.

* Invited Paper

SESSION BM6.1: Bioinspired Material Interfaces and Surfaces for the Control of Wetting I
Session Chairs: Alon Gorodetsky and Hendrik Hoelscher
Monday Morning, November 28, 2016
Hynes, Level 2, Room 200

8:30 AM *BM6.1.01

SLIPERS—When a Pitcher Plant Meets SERS Shikuan Yang, Birgitt B. Stogin, Xianming Dai and [Tak Sing Wong](#); The Pennsylvania State University, United States.

9:00 AM BM6.1.02

A Bioinspired Liquid-Repellent Material with Switchable Slippery and Superhydrophobic Functions [Yu Huang](#), Nan Sun, Birgitt B. Stogin, Jing Wang, Shikuan Yang and Tak Sing Wong; The Pennsylvania State University, United States.

9:15 AM BM6.1.03

How Water Advances on Superhydrophobic Surfaces [Frank Schellenberger](#) and Noemi Encinas; MPI for Polymer Research, Germany.

9:30 AM BM6.1.04

Fabrication and Dynamic Wetting Properties of Bioinspired, Three-Dimensional Hierarchical Wrinkles [Won-Kyu Lee](#)¹ and Teri W. Odom^{1,2}; ¹Northwestern University, United States; ²Northwestern University, United States.

9:45 AM BM6.1.05

Tunability of Infused Polymers as Immobilized Liquid Layer Substrates [Caitlin Howell](#)^{1,2}, Irini Sotiri^{2,3} and Joanna Aizenberg^{2,3}; ¹University of Maine, United States; ²Harvard University, United States; ³Wyss Institute, United States.

10:00 AM BREAK

10:30 AM *BM6.1.06

The Role of Hard Nanofibers in Frog's Soft Adhesive Microstructures [Aranzazu del Campo](#) and Longjian Xue; INM-Leibniz Institute for New Materials, Germany.

11:00 AM BM6.1.07

Synthetic Butterfly-Inspired Scale Surfaces with Tunable Compliance and Anisotropic Droplet Adhesion [Hangbo Zhao](#), Sei Jin Park, Brian Solomon, Sanha Kim, Adam T. Paxson, Yu Zou, Kripa Varanasi and A. John Hart; Massachusetts Institute of Technology, United States.

11:15 AM BM6.1.08

Prevention of Protein and Bacterial Adhesion on Super-Liquid Repellent Coatings Noemi Encinas¹, Maxime Paven¹, Lars Schmueser¹, David Castner², Tobias Weidner¹, Daniel Graham², Hans-Jurgen Butt¹ and Doris Vollmer¹; ¹Max Planck Institute for Polymer Research, Germany; ²University of Washington, United States.

11:30 AM BM6.1.09

Bioinspired Pressure-Stable Superhydrophobic Surface for Drag Reduction Maryna N. Kavalenka, Felix Vuellers, Yann Germain, Luce-Marie Petit, Matthias Worgull and Hendrik Hoelscher; Karlsruhe Institute of Technology, Germany.

11:45 AM BM6.1.10

Bio-Inspired Shark Skin Structures for Antibacterial/Antifouling Surfaces Feyza Dundar, Kristopher W. Kolewe, Jessica D. Schiffman and James J. Watkins; University of Massachusetts, Amherst, United States.

SESSION BM6.2: Bioinspired Material Interfaces and Surfaces for the Control of Wetting II
Session Chair: Vinod Saranathan
Monday Afternoon, November 28, 2016
Hynes, Level 2, Room 200

1:30 PM BM6.2.01

Bio-Inspired Multifunctional Surface Wrinkling Based on Mechanical Instability Hiroshi Endo; Toyama Prefectural University, Japan.

1:45 PM BM6.2.02

Bioinspired Highly Transmissive Superhydrophobic Films for Optical Applications Felix Vuellers¹, Guillaume Gomard^{1,2}, Jan B. Preinfalk², Efthymios Klampaftis¹, Bryce Richards¹, Hendrik Hoelscher¹ and Maryna N. Kavalenka¹; ¹Karlsruhe Institute of Technology, Germany; ²Karlsruhe Institute of Technology, Germany.

SESSION BM6.3: Bioinspired Optics and Photonics I
Session Chair: Tak Sing Wong
Monday Afternoon, November 28, 2016
Hynes, Level 2, Room 200

2:00 PM *BM6.3.01

Dynamic Materials—From Cephalopods to Shapeshifters Alon Gorodetsky; University of California, Irvine, United States.

2:30 PM BM6.3.02

Contributions of Phenoxazone-Based Pigments to the Adaptive Color in Cephalopods Leila Deravi; Northeastern University, United States.

2:45 PM BM6.3.03

Marine Life Inspired Sensitive and Reversible Mechanochromisms via Strain Tunable Cracks and Folds Songsan Zeng¹, Dianyun Zhang², Wenhan Huang³, Zhao Feng Wang¹, Stephan G. Freire¹, Xiaoyuan Yu⁴, Andrew T. Smith¹, Emily Y. Huang¹ and Luyi Sun¹; ¹University of Connecticut, United States; ²University of Connecticut, United States; ³Heyuan Polytechnic, China; ⁴South China Agricultural University, China.

3:00 PM BREAK

3:30 PM *BM6.3.04

Biomimetic Potential of Self-Assembled Biophotonic Nanostructures Vinodkumar Saranathan^{1,2,3}; ¹Yale-NUS College, Singapore; ²National University of Singapore, Singapore; ³National University of Singapore, Singapore.

4:00 PM BM6.3.05

Synthetic Giant Clam Cells as Efficient Solar Transformers Hye-Na Kim¹, Sanaz Vahidinia², Amanda Holt², Alison Sweeney² and Shu Yang¹; ¹University of Pennsylvania, United States; ²University of Pennsylvania, United States.

4:15 PM BM6.3.06

Extreme Refractive Index Wing Scale Beads Cause the Bright Colors in Pierid Butterflies Bodo Wilts¹, Ullrich Steiner¹ and Doekele Stavenga²; ¹Adolphe Merkle Institute, Switzerland; ²University of Groningen, Netherlands.

4:30 PM BM6.3.07

Chemical Nanotomography of Interfaces and Interphases in Tooth Biominerals Derk Joester; Northwestern University, United States

SESSION BM6.4: Poster Session I
Monday Afternoon, November 28, 2016
8:00 PM - 10:00 PM
Hynes, Level 1, Hall B

BM6.4.01

Controlling Circularly Polarized Light Reflection from Chiral Nematic Ordered Cellulose Nanocrystal (CNC) Films Takayuki Hiratani¹, Wadood Y. Hamad² and Mark J. MacLachlan¹; ¹University of British Columbia, Canada; ²FPInnovations, Canada.

BM6.4.02

Microencapsulation of Aliphatic Amines Using Protection Chemistry and On-Demand Deprotection for Self-Healing and Self-Reporting Materials Wenle Li, Ke Yang, Jeffrey S. Moore, Scott R. White and Nancy R. Sottos; University of Illinois at Urbana-Champaign, United States.

BM6.4.03

Artificial Architecture Mimicking Extracellular Matrix (ECM) Structure Young Ju Son; Kangwon National University, Korea (the Republic of).

BM6.4.04

Tailoring Magnetic Anisotropy in the Hierarchical Wood Structure Vivian Merk^{3,1}, Lion Raaz^{3,1}, Munish Chanana^{3,1}, Ann Hirt² and Ingo Burgert^{3,1}; ¹Swiss Federal Laboratories for Material Science and Technology, Switzerland; ²ETH Zurich, Switzerland; ³ETH Zurich, Switzerland.

BM6.4.05

Bio-Inspired Scaffolds for Wound Healing Applications Walaa Abbas, Alaa Faïd, Ayat Elshazly and Nageh K. Allam; American University in Cairo, Egypt.

BM6.4.06

Complex Emulsions as Reconfigurable Compound Micro-Lenses Sara Nagelberg¹, Lauren D. Zarzar¹, Natalie Nicholas¹, Kaushikaram Subramanian², Julia Kalow¹, Vishnu Sresht¹, Daniel Blankschtein¹, Moritz Kreysing², Timothy M. Swager¹ and Mathias Kolle¹; ¹Massachusetts Institute of Technology, United States; ²Max Planck Institute of Molecular Cell Biology and Genetics, Germany.

BM6.4.07

Morphological and Organic-Inorganic Interface Characterizations in Banana Slug Radula Teeth Xiaolin Zhang^{1,2}, Joel Sohn², Janet Leonard³, Frank Wells³ and Marco Rolandi^{1,2}; ¹University of Washington, United States; ²University of California, Santa Cruz, United States; ³University of California Santa Cruz, United States.

BM6.4.08

Morphological Studies of Bioinspired Vesicle Under Laminar Flow Through DPD Approach Xiang Yu, Xiaolei Chu, Joseph Greenstein, Fikret Aydin, Geetarth Uppaladadi and Meenakshi Dutt; Rutgers University, United States.

BM6.4.09

Tuning the Adhesion Strength of Hydrogel Bonding German A. Parada¹ and Xuanhe Zhao²; ¹Massachusetts Institute of Technology, United States; ²Massachusetts Institute of Technology, United States.

BM6.4.10

Pd-Ir Nanoparticles Encapsulated Plasmonic Vesicles for Colorimetric Detection of Cancer Biomarkers at the Femtogram/mL Level Kuikun Yang¹, Xiaohu Xia² and Zhihong Nie¹; ¹University of Maryland, United States; ²Michigan Technological University, United States.

BM6.4.11

Impact of Different Liquid Drops on Micro/Nano-Structured Superhydrophobic Surfaces Federico Veronesi^{1,2}, Ileana Malavasi³, Maurizio Zani^{5,6}, Mariaros Raimondo¹ and Marco Marengo^{3,4}; ¹Institute of Science and Technology for Ceramics, Italy; ²University of Parma, Italy; ³University of Bergamo, Italy; ⁴University of Brighton, United Kingdom; ⁵Politecnico di Milano, Italy; ⁶Istituto Italiano di Tecnologia, Italy.

BM6.4.12

Kinetics of Silver Nanoparticle Release from Chitosan Spheres Luci C. Vercik, Andres Vercik and Eliana C. Rigo; University of Sao Paulo, Brazil.

BM6.4.13

Influence of Multiscale Architectural Cues on Cells Baoce Sun and Raymond H. Lam; City University of Hong Kong, Hong Kong.

BM6.4.14

Probing Chemical and Physical Properties of Poplar Tension Wood Using Confocal Raman Microscopy and Pulsed Force Mode Atomic Force Microscopy Mikhael Soliman^{2,1} and Laurene Tetard^{1,2}; ¹NanoScience Technology Center, United States; ²University of Central Florida, United States.

BM6.4.15

A Facile Method to Improve Moisture Resistance of Long Persistent Phosphor Materials Xiaodi Shi and Xihua Lu; Donghua University, China.

BM6.4.16

Water Filtration Using Naturally-Occurring Membranes in Plant Xylem Krithika Ramchander and Rohit Karnik; Massachusetts Institute of Technology, United States.

BM6.4.17

Friction of Droplets Sliding on Superhydrophobic Surfaces Shasha Qiao, Qunyang Li and Xiqiao Feng; Tsinghua University, China.

BM6.4.18

Liquid Spreading in Wharf Roach-Inspired Capillary-Driven Open-Air Channels Koji Muto, Shuto Ito and Daisuke Ishii; Nagoya Institute of Technology, Japan.

BM6.4.19

Biomolecule-Directed Evolution of Inorganic Nanomaterials Thembankosi G. Gaule, Shunbo Li, Michael McPherson and Fiona C. Meldrum; University of Leeds, United Kingdom.

BM6.4.20

The Micro/Nanoscale Tribological and Mechanical Investigation of the Articular Surfaces of the Katydid Joints—Potential for the Novel Bio-Inspired Lubrication Systems Jun K. Oh and Mustafa Akbulut; Texas A&M University, United States.

BM6.4.21

Antifouling Membranes by Bio-Inspired Coating of Dopamine and Zwitterionic Polymers Nima Shakaramipour, Sankara Ramanan, Chong Cheng and Haiqing Lin; State University of New York at Buffalo, United States.

BM6.4.22

Computational Design of Peptide-Based Nanomaterials Srinivas C. Mushnoori and Meenakshi Dutt; Rutgers University, United States.

BM6.4.23

Superhydrophobic Carbon Nanotube Composites—Mimicking Nature with Laser Ablation Joshua A. Maurer, Michael Miller and Stephen Bartolucci; U.S. Army Armament Research, Development and Engineering Center, United States.

BM6.4.24

Guided Self-Propelled Leaping of Droplets on a Micro-Anisotropic Superhydrophobic Surface Jie Liu; Chinese Academy of Sciences, China.

BM6.4.25

Virus-Mimicking Polymer Molecular Brushes—Hydrophilic Membrane Active Antibiotics with Nanostructure-Dependent Activity and Selectivity Hongjun Liang; Texas Tech University, United States.

BM6.4.26

PEGylated Rosette Nanotubes as Hydrogel Biomaterials—Synthesis, Self-Assembly, and Biocompatibility Yiwen Fan, Arthur A. Gonzales and Hicham Fenniri; Northeastern University, United States.

BM6.4.27

Nanofibrillar Networks of Soft Nanotubes by Templated Layer-by-Layer Assembly Shouwei Zhang, Celine Vlemineq, Diana Ramirez-Wong, Delphine Magnin, Karine Glinel, Sophie Demoustier-Champagne and Alain M. Jonas; Université Catholique de Louvain, Belgium.

BM6.4.28

Exploring the Mechanical Properties of Bio-Inspired Metal-Coordinate Coatings Erica Lai¹, Joseph Sandt², Mathias Kolle² and Niels Holten-Andersen¹; ¹Massachusetts Institute of Technology, United States; ²Massachusetts Institute of Technology, United States.

BM6.4.29

Bio-Inspired Synthesis of Three-Dimensional Gold-Silica Hybrid Nanostructures for SERS Applications Kyeong Rak Kim¹, Ho Yeon Son¹, Jun Bae Lee³, Jin Woong Kim^{4,5} and Yoon Sung Nam^{1,2}; ¹Korea Advanced Institute of Science and Technology, Korea (the Republic of); ²Korea Advanced Institute of Science and Technology, Korea (the Republic of); ³COSMAX, Korea (the Republic of); ⁴Hanyang University, Korea (the Republic of); ⁵Hanyang University, Korea (the Republic of).

BM6.4.30

Composite Membranes of Collagen and Hydroxyapatite for Drug Carrying Support Daichi Kajiwara and Toshiyuki Ikoma; Tokyo Institute of Technology, Japan.

BM6.4.31

Biomimetic Nanostructured Coating Used to Reduce Friction Antonino Bonanno¹, Mariaros Raimondo², Luca Pastorello¹, Federico Veronesi², Giorgio Paolo Massarotti¹ and Guia Guarini²; ¹CNR-IMAMOTER, Italy; ²CNR-ISTEC, Italy.

BM6.4.32

Bio-Inspired Fish-Skin Materials—Microfabrication, Characterization, and Application Sukwon Jung¹, Tong Shen², Marti G. Font², Franck J. Vernerey² and Mark P. Stoykovich¹; ¹University of Colorado Boulder, United States; ²University of Colorado Boulder, United States.

BM6.4.33

Alignment of Cellulose Nanofiber with Nematic Liquid Crystal Tao Huang, Keiichi Kuboyama, Yuuki Kimura and Toshiaki Ougizawa; Tokyo Institute of Technology, Japan.

BM6.4.34

Development of a New Class of Dendrimeric “Gecko Legs” Polymer Particles with Extraordinary Adhesive and Structure-Building Capabilities Sangchul Roh¹, Dong Hun Shin¹, Simeon D. Stoyanov^{2,3} and Orlin D. Velev¹; ¹North Carolina State University, United States; ²Wageningen University, Netherlands; ³University College London, United Kingdom.

BM6.4.35

Wavelength-Dependent Light-Driven Nanomotor Jizhuang Wang, Ze Xiong, Baohu Dai and Jinyao Tang; University of Hong Kong, China.

SESSION BM6.5: Bioinspired Design and Applications I
Session Chair: Mathias Kolle
Tuesday Morning, November 29, 2016
Hynes, Level 2, Room 200

8:30 AM *BM6.5.01

Combining Lessons from Three Different Species to Design a New Material for Water Condensation Joanna Aizenberg and Kyoo-Chul Park; Harvard University, United States.

9:00 AM BM6.5.02

Smart Adaptive Materials with Sensing, Healing and Self-Shaping Capabilities Eleonora D’Elia, Hanae Said, Victoria G. Rocha and Eduardo S. Gutierrez; Imperial College London, United Kingdom.

9:15 AM BM6.5.03

Design and Manufacture of Bio-inspired Microstructures—A Study on the Material-Structure Relation Alejandro Gutierrez and Lilian P. Davila; University of California, Merced, United States.

9:30 AM BM6.5.04

Controllable Reconfiguration of Bio-Inspired Nanoparticle Networks under Torsion Tao Zhang, Badel L. Mbanga, Victor V. Yashin and Anna C. Balazs; University of Pittsburgh, United States.

9:45 AM BM6.5.05

Bio-Inspired Smart Gating Membranes Xu Hou^{1,2}; ¹Xiamen University, China; ²Collaborative Innovation Center of Chemistry for Energy Materials, China.

10:00 AM BREAK

10:30 AM *BM6.5.06

Bio-Inspired, Mechanically Adaptive and Adapting Polymer Systems Christoph Weder; University of Fribourg, Switzerland.

11:00 AM BM6.5.07

Nanostructure of Wood Cell Walls as Inspiration for New Stimuli-Responsive Materials Joseph Jakes; US Forest Service, United States.

11:15 AM BM6.5.08

A Coarse-Grained Model for Hemicellulose Lik-Ho Tam and Dennis Lau; City University of Hong Kong, Hong Kong.

11:30 AM BM6.5.09

Flow Based Approach for the Fabrication of Super-Strong Nanocellulose Filaments—An Attempt to Utilize its Potential Nitesh Mittal, Fredrik Lundell and Daniel Soderberg; KTH Royal Institute of Technology, Sweden.

11:45 AM *BM6.5.10

Flexible Organic Electronic Materials Based on Cellulose Nanocrystals Wadood Y. Hamad and Siham Atifi; FPIInnovations, Canada.

SESSION BM6.6: Bioinspired Optics and Photonics II
Session Chairs: Maryna Kavalenka and Christoph Weder
Tuesday Afternoon, November 29, 2016
Hynes, Level 2, Room 200

1:30 PM BM6.6.01

Cellulose-based Multifunctional Photonic Structure Giulia Guidetti¹, Bruno Frka-Petesic¹, Andre Espinha², Maria C. Serrano³, Ahu Gumrah Dumanli¹, Siham Atifi⁴, Wadood Y. Hamad⁴, Alvaro Blanco², Cefe Lopez² and Silvia Vignolini¹; ¹University of Cambridge, United Kingdom; ²Consejo Superior de Investigaciones Científicas, Spain; ³Servicio de Salud de Castilla La Mancha, Spain; ⁴FP Innovation, Canada.

1:45 PM BM6.6.02

Structural Color from Co-Assembled Cellulose Nanocrystals and Silk Fibroin Bruno Frka-Petesic¹, Giulia Guidetti¹, Benedetto Marelli³, Fiorenzoomenetto² and Silvia Vignolini¹; ¹University of Cambridge, United Kingdom; ²Tufts University, United States; ³Massachusetts Institute of Technology, United States.

2:00 PM BM6.6.03

Enhanced Photovoltaics Inspired by the Fovea Centralis Sebastian Schmitt; Helmholtz Zentrum Berlin für Materialien und Energie, Germany.

2:15 PM BM6.6.04

Synthesis and Characterization of Optically Transparent Wood Haritha Sree Yaddanapudi, Nathan Hickerson, Shrikant Saini and Ashutosh Tiwari; University of Utah, United States.

2:30 PM BM6.6.05

Bio-Inspired Aluminium-Based Random Plasmonic Metasurface for Biosensing Applications Radwanul H. Siddique¹, Shailabh Kumar¹, Jan Mertens², Hendrik Hoelscher³, Silvia Vignolini² and Hyuck Choo¹; ¹California Institute of Technology, United States; ²University of Cambridge, United Kingdom; ³Karlsruhe Institute of Technology, Germany.

2:45 PM BM6.6.06

Structural Colors in Network Metamaterials Henning Galinski^{1,2}, Hao Dong¹, Max Dobeli⁴, Andrea Fratallocchi³, Ralph Spolenak¹ and Federico Capasso²; ¹ETH Zurich, Switzerland; ²Harvard University, United States; ³King Abdullah University of Science and Technology, Saudi Arabia; ⁴ETH Zurich, Switzerland.

3:00 PM BREAK

3:30 PM *BM6.6.07

Photonic Arms, Legs and Skin Diederik Wiersma; University of Florence, Italy.

4:00 PM BM6.6.08

Tuning the Optical Response of Cellulose Nanocrystals Rox Middleton, Giulia Guidetti and Silvia Vignolini; University of Cambridge, United Kingdom.

4:15 PM BM6.6.09

Tunable Elastomeric Photonic Fibers for Colorimetric Determination of Applied Pressure in Compression Therapy Joseph Sandt, Christian Argenti and Mathias Kolle; Massachusetts Institute of Technology, United States.

4:30 PM BM6.6.10

Anisotropic Photonic Spheres with a Gradient of Structural Colors for Multi-Coloration Seung Yeol Lee and Shin Hyun Kim; Korea Advanced Institute of Science and Technology, Korea (the Republic of).

4:45 PM BM6.6.11

DNA-Colloidal Gels with Tunable Pore Sizes Showing Structural Color Zachary Ruff, Clare P. Grey and Erika Eiser; University of Cambridge, United Kingdom.

SESSION BM6.7: Bioinspired Design and Applications II
Session Chairs: Radwanul Siddique and Silvia Vignolini
Wednesday Morning, November 30, 2016
Hynes, Level 2, Room 200

8:30 AM *BM6.7.01

Bio-Inspired Metal-Coordination Dynamics—An Easier Way to Engineer Supramolecular Mechanics Niels Holten-Andersen; Massachusetts Institute of Technology, United States.

9:00 AM BM6.7.02

The Role of Hydroxide and Metal Concentration on the Mechanical Properties of Metal Coordinated Gels Seth A. Cazzell and Niels Holten-Andersen; Massachusetts Institute of Technology, United States.

9:15 AM BM6.7.03

Bio-Inspired Hierarchically Structured Snapping Multifunctional Composites Hortense Le Ferrand², Andre R. Studart² and Andres F. Arrieta¹; ¹Purdue University, United States; ²ETH Zurich, Switzerland.

9:30 AM BM6.7.04

Learning from Nature—How to Engineer Semiconductor Bandgaps by the Incorporation of Amino Acids into Semiconductor Crystals Boaz Pokroy; Technion Israel Institute of Technology, Israel.

9:45 AM BM6.7.05

Nitroaromatic Detection and Infrared Communication from Wild-Type Plants Using Plant Nanobionics Min Hao Wong, Juan Pablo Giraldo, Seon-Yeong Kwak, Volodymyr Koman, Pingwei Liu, Rosalie Sinclair, Gili Bisker, Tedrick Salim Lew and Michael Strano; Massachusetts Institute of Technology, United States.

10:00 AM BREAK

10:30 AM *BM6.7.06

Biopolymer Based Technological Interfaces Fiorenzoomenetto; Tufts University, United States.

11:00 AM BM6.7.07

Thermal Stability of Recombinant Spider Silk as Robust Structural Materials Anh T. Dao¹, Koyuru Nakayama¹, Jun'ichi Shimokata^{2,1} and Toshiaki Taniike¹; ¹Japan Advanced Institute of Science and Technology, Japan; ²Spiber Inc., Japan.

11:15 AM BM6.7.08

Toughness-Enhancing 1D Metastructure in Recluse Spider's Nanoribbon Silk Sean R. Koebley and Hannes C. Schniepp; College of William and Mary, United States.

11:30 AM BM6.7.09

Bacterially-Produced, Nacre-Inspired Microcomposite Materials Demonstrate Improved Recovery of Elastic Energy Ewa M. Spiesz¹, Dominik T. Schmieden¹, Antonio M. Grande², Santiago J. Garcia², Anne S. Meyer¹ and Marie-Eve Aubin-Tam¹; ¹Delft University of Technology, Netherlands; ²Delft University of Technology, Netherlands.

11:45 AM BM6.7.10

Biohybrid Microtube Swimmers Powered by Captured Bacteria Morgan M. Stanton¹, Byung-Wook Park¹, Albert Miguel-Lopez², Metin Sitti¹ and Samuel Sanchez^{2,3}; ¹Max Planck Institute for Intelligent Systems, Germany; ²Institute for Bioengineering of Catalonia, Spain; ³Catalan Institution for Research and Advanced Studies, Spain.

SESSION BM6.8: Novel Approaches for the Fabrication and Characterization of Bioinspired Materials—3D Printing
Session Chairs: Niels Holten-Andersen and LaShanda Korley
Wednesday Afternoon, November 30, 2016
Hynes, Level 2, Room 200

1:30 PM BM6.8.01

Method of 3D Printing Micro-Pillar Array on Surfaces Jifei Ou, Gershon Dublon, Chin-Yi Cheng and Hiroshi Ishii; Massachusetts Institute of Technology, United States.

1:45 PM BM6.8.02

3D Printing of Cellular Ceramic Architectures with Hierarchical Porosity Joseph Muth^{1,2}, Patrick Dixon⁴, Logan Woish³, Lorna Gibson⁴ and Jennifer A. Lewis^{1,2}; ¹Harvard University, United States; ²Wyss Institute, United States; ³Colorado School of Mines, United States; ⁴Massachusetts Institute of Technology, United States.

2:00 PM BM6.8.03

Biomimetic 3D-Printed Impact Resistant Polymer Composites Grace Gu and Markus J. Buehler; Massachusetts Institute of Technology, United States.

2:15 PM BM6.8.04

3D Printing of Liquid-in-Gel, Tissue-Like Materials Joseph S. Najem, Elio Challita, Eric Freeman and Donald Leo; University of Georgia, United States.

2:30 PM BREAK

SESSION BM6.9: Novel Approaches for the Fabrication and Characterization of Bioinspired Materials—Composites and Bioderivatives
Session Chairs: Fiorenzo Omenetto and Julia Syurik
Wednesday Afternoon, November 30, 2016
Hynes, Level 2, Room 200

3:30 PM *BM6.9.01

Inspired by Nature—Scalable Fabrication of Functional Fiber Scaffolds and Fiber-Reinforced Hydrogels LaShanda Korley and Alex Jordan; Case Western Reserve University, United States.

4:00 PM BM6.9.02

The Mimosa-Origami Effect—Large Scale Self-Assembly via Janus-Bilayer Enhanced Elastocapillary William S. Wong¹, Vincent S. Craig¹, Zuankai Wang² and Antonio Tricoli¹; ¹Australian National University, Australia; ²City University of Hong Kong, China.

4:15 PM BM6.9.03

Fabrication of Multifunctional Macroscopic Materials from Engineered E. Coli Curli Protein Nanofibers Noemie-Manuelle Dorval Courchesne¹, Anna Duraj-Thatte^{1,2}, Pei Kun Richie Tay^{1,2} and Neel S. Joshi^{1,2}; ¹Harvard University, United States; ²Harvard University, United States.

4:30 PM BM6.9.04

A Biomimetic Anisotropic Chitin-Silk Composite from Electric-Field Directed Assembly Xiaolin Zhang^{1,2}, Yu Wang³, Benedetto Marelli³, Pegah Hassanzadeh^{1,2}, Fiorenzo Omenetto³ and Marco Rolandi^{1,2}; ¹University of Washington, United States; ²University of California, Santa Cruz, United States; ³Tufts University, United States.

4:45 PM BM6.9.05

Characterization and Modeling of Mycelium Based Biocomposites Mohammad Islam¹, Leah Smith², Greg Tudryn³, Ronald Bucinell⁴, Linda S. Schadler² and Catalin R. Picu¹; ¹Rensselaer Polytechnic Institute, United States; ²Rensselaer Polytechnic Institute, United States; ³Ecovative Design LLC, United States; ⁴Union College, United States.

SESSION BM6.10: Poster Session II
Wednesday Afternoon, November 30, 2016
8:00 PM - 10:00 PM
Hynes, Level 1, Hall B

BM6.10.01

Flexible Inorganic-Based Piezoelectric Acoustic Nanosensors Inspired by Human Cochlea Jae Hyun Han, Daniel Joe and Keon Jae Lee; Korea Advanced Institute of Science and Technology, Korea (the Republic of).

BM6.10.02

Flexible and Ultra-Stable SERS Substrates Prepared by Facile Biomimic Adhesive Coating Yida Liu, Ali Demirci, Huie Zhu, Jinguang Cai, Shunsuke Yamamoto, Akira Watanabe, Tokuji Miyashita and Masaya Mitsuishi; Tohoku University, Japan.

BM6.10.03

3-D Printing of Bio-Inspired Composites Susan D. Wettermark¹, Grace Gu¹ and Markus J. Buehler²; ¹Massachusetts Institute of Technology, United States; ²Massachusetts Institute of Technology, United States.

BM6.10.04

Design and Characterization of Polymer Hydrogels Formed via Dynamic Linkages between Boronate Esters and Biological Phenols/Polyphenols Zhuojun Huang and Phillip B. Messersmith; University of California, Berkeley, United States.

BM6.10.05

Realization of Inorganic Structural Colors of a 2D Photonic Crystal Ha Nee Umh, Sungju Yu, Yonghwa Kim, Su Young Lee, Hyeon Don Song and Jongheop Yi; Seoul National University, Korea (the Republic of).

BM6.10.06

Bio Inspired Superhydrophobic Surfaces for Enhanced Underwater Stability and Regenerative Drag Reduction Capability Seunghyeon Baek, Junghan Lee and Kijung Yong; Pohang University of Science and Technology, Korea (the Republic of).

BM6.10.07

Improvement of Drop-on-Demand Droplet Formation Frequency by a Superhydrophobic Nozzle In Ho Choi, Aree Kim, Jongkyeong Lim and Joonwon Kim; Pohang University of Science and Technology, Korea (the Republic of).

BM6.10.08

Spatially Selective Nucleation and Growth of Water Droplets on Hierarchically Patterned Polymer Surfaces Younghyun Cho¹, Dong Kook Kim¹ and Shu Yang²; ¹Korea Institute of Energy Research, Korea (the Republic of); ²University of Pennsylvania, United States.

BM6.10.09

Patterning and Nanoscale Characterization of Ferroelectric Aminoacid β -glycine Maxim Ivanov^{1,2}, H. Lu³, O. Bak³, Ensieh Seyedhosseini¹, Pavel Zelenovskiy⁴, Vladimir Shur⁴, Alexei Gruverman³ and Andrei Kholkin¹; ¹University of Aveiro, Portugal; ²Institute of Physics and Technology, Moscow Technological University – MIREA, Russian Federation; ³University of Nebraska, United States; ⁴Institute of Natural Sciences, Ural Federal University, Russian Federation.

BM6.10.10

Polymer Coated Bio-Inspired Layered Nanomaterials for Mineral Supplement Soo-Jin Choi; Seoul Women's University, Korea (the Republic of).

BM6.10.11

'Powder' Cellulose Nanocrystal (Nanowhisker) for Filler Applications Toshihiko Arita¹ and Jun Araki²; ¹Tohoku University, Japan; ²Shinshu University, Japan.

BM6.10.12

Probing the Nanomechanical Properties of Bioinspired Mineral-Organic Composites (ACC) Josue Lopez-Berganza, Yijue Diao, Jonathan Patton and Rosa M. Espinosa-Marzal; University of Illinois at Urbana-Champaign, United States.

BM6.10.13

Long-Range Electron Conduction in Bioinspired Peptide Nanofibers Nicole L. Ing and Allon Hochbaum; University of California, Irvine, United States.

BM6.10.14

Bioinspired Dual-Crosslinked Tough Silk Hydrogel as Protective Reaction Matrix for Carbon Sequestration Using Carbonic Anhydrase Chang Sup Kim¹, Yun Jung Yang² and Hyung Joon Cha²; ¹Yeungnam University, Korea (the Republic of); ²Pohang University of Science and Technology, Korea (the Republic of).

BM6.10.15

Clay-Based Multi-Functional Films with Nacre-Like Structure Jingjing Liu, Sharon Lin, Arie Havason, William C. Masinda, Lauren M. Kovacs, Brittany Bendel, Kacie M. Well, Evan R. Dall, Ornella Tempo and Luyi Sun; Institute of Materials Science, United States.

BM6.10.16

Unpowered Oil Absorption by Wettability Sponge Based Oil Skimmer Ziai Liu, Jinlong Song and Xuyue Wang; Dalian University of Technology, China.

BM6.10.17

Natural Rice-Derived Transparent Film for Organic Field Effect Transistors Guoyan Zhang^{1,2}, Huai Yang² and Elsa Reichmanis¹; ¹Georgia Institute of Technology, United States; ²Peking University, China.

BM6.10.18

Stiffness-Based Separation of Giant Liposomes via Acoustophoresis Ata Dolatmoradi and Bilal El-Zahab; Florida International University, United States.

BM6.10.19

Confined, Oriented and Electrically Anisotropic Graphene Wrinkles on Bacteria Shikai Deng¹, Enlai Gao², Yanlei Wang², Soumyo Sen¹, T. S. Sreeprasad³, Sanjay Behura¹, Petr Kral¹, Zhiping Xu² and Vikas Berry¹; ¹University of Illinois at Chicago, United States; ²Tsinghua University, China; ³Clemson University, United States.

BM6.10.20

Design, Fabrication and Testing of a Low-Cost Diatom Sorter System Senam Tamakloe, Alejandro Gutierrez and Lilian P. Davila; University of California, Merced, United States.

BM6.10.21

Design of Bistable Dome-Shaped Dielectric Elastomer Actuators Eesha Khare, Samuel Shian and David R. Clarke; Harvard John A. Paulson School of Engineering and Applied Sciences, United States.

BM6.10.22

A Modular Architecture for Dynamic, Environmentally Adaptive DNA Nanostructures Deepak A. Agrawal, Abdul M. Mohammed, Tyler Jorgenson, Seth Reinhart, Samuel Schaffter and Rebecca Schulman; Johns Hopkins University, United States.

BM6.10.23

Synthesis and Characterization of Nickel/Carbon Nanocomposite from Wood as Electrodes for Environmentally Friendly Supercapacitors Haritha Sree Yaddanapudi, Kun Tian and Ashutosh Tiwari; University of Utah, United States.

BM6.10.24

Water Repellency of Nanotextured Polymer Surfaces Assisted Using a Monolithic Porous Alumina Hoichang Yang² and Mi Jang¹; ¹Pohang University of Science and Technology, Korea (the Republic of); ²Inha University, Korea (the Republic of).

BM6.10.25

The Inhibition of Sintering in the Synthesis of Bioinspired Ceramic Nano-Structures Dean Fletcher and Zoe Schnepf; University of Birmingham, United Kingdom.

BM6.10.26

Patterning Functional Biofilms with Light-Sensing Bacteria Eleonore Tham², Felix Moser¹, Jesus Fernandez-Rodriguez¹, Chris Voigt¹ and Tim Lu¹; ¹Massachusetts Institute of Technology, United States; ²Massachusetts Institute of Technology, United States.

BM6.10.27

Bioprinting for Creating and Growing Ceramic Armour on Demand Bethany Hickton¹, Adam W. Perriman¹, Paul Curnow¹ and Richard Trask²; ¹University of Bristol, United Kingdom; ²University of Bath, United Kingdom.

BM6.10.28

Multi-Functional DNA-Peptide Nanotubes as Artificial Extracellular Matrices for Bone Repair Gujie Mi¹, Di Shi¹ and Thomas J. J. Webster^{1,2}; ¹Northeastern University, United States; ²King Abdulaziz University, Saudi Arabia.

BM6.10.29

Electrospinning of Biocompatible Aromatic Peptide Nano-Fibers Yasaman Hamedani^{1,2} and Milana C. Vasudev¹; ¹University of Massachusetts Dartmouth, United States; ²University of Massachusetts Dartmouth, United States.

BM6.10.30

Nanostructured Biomaterials as SERS Substrate Andressa M. Kubo, Luiz F. Gorup, Luciana S. Amaral, Edson R. Filho, Edson R. Leite, Elson Longo and Emerson R. Camargo; Federal University of São Carlos, Brazil.

BM6.10.31

Sponge-Inspired Porous Structured Pressure Sensor for Highly Sensitive Real-Time Tactile Sensing Subin Kang, Jaehong Lee, Sanggeun Lee and Taeyoon Lee; Yonsei University, Korea (the Republic of).

BM6.10.32

Development of Tunnel-Current Biomolecule Structural Measurement towards Single-Biomolecule Function Detection Takahito Ohshiro, Makusu Tsutsui, Kazumichi Yokota and Masateru Taniguchi; Osaka University, Japan.

BM6.10.33

Stimuli-Responsive Electrospun Superhydrophobic Fabrics with Multifunctionality Ho Sun Lim¹ and Jeong Ho Cho²; ¹Sookmyung Women's University, Korea (the Republic of); ²Sungkyunkwan University, Korea (the Republic of).

BM6.10.34

Development of Inorganic and Organic Composite Material with High Transparency and Toughness, Formed by the Union of Fine Silica Particles Aggregation with Short-Range Order and Flexible Polymer Gel Kenta Watanabe¹, Takahiro Seki¹, Yukikazu Takeoka¹, Kenji Urayama², Abu bin Imran² and Motoki Suzuki⁴; ¹Nagoya University, Japan; ²Bangladesh University of Engineering and Technology, Bangladesh; ³Kyoto Institute of Technology, Japan; ⁴Kyocera Document Solutions, Japan.

BM6.10.35

Designing Durable Icephobic Surfaces Kevin B. Golovin and Anish Tuteja; University of Michigan, United States.

BM6.10.36

Optomechanical Coupling for the Study of the Dynamic Mechanical Properties of Metal-Coordinate Gels Irina Mahmud Rasid, Bradley Olsen and Niels Holten-Andersen; Massachusetts Institute of Technology, United States.

BM6.10.37

Bio-Inspired Nano-CarboScavengers for Rehabilitation of Petroleum Contaminated Water Santosh K. Misra^{1,2,3}, Enrique Daza^{1,2,3}, John Scott⁴, Christine Promise¹, Brajendra Sharma⁴, Indu Tripathi^{1,2}, Jacek Topczewski⁵, Santanu Chaudhuri⁶ and Dipanjan Pan^{1,2}; ¹University of Illinois at Urbana Champaign, United States; ²Mills Breast Cancer Institute, United States; ³University of Illinois at Urbana Champaign, United States; ⁴Illinois Sustainable Technology Center, Prairie Research Institute, University of Illinois at Urbana Champaign, United States; ⁵Department of Pediatrics, Northwestern University Feinberg School of Medicine, Stanley Manne Children's Research Institute, United States; ⁶Applied Research Institute, United States.

BM6.10.38

ABSTRACT WITHDRAWN

BM6.10.39

Rapid Fabrication of Self-Assembled Bacterial Spore Actuators Onur Cakmak¹, Xi Chen¹, Ahmet-Hamdi Cavusoglu², Michael DeLay¹, Adam Driks³ and Ozgur Sahin^{1,4}; ¹Columbia University, United States; ²Columbia University, United States; ³Loyola University Chicago, United States; ⁴Columbia University, United States.

BM6.10.40

Mapping the Mechanical Properties of Biopolymer Composite Using Advanced Instrumented Indentation Yujie Meng, Warren Oliver, Siqun Wang and Kurt Johanns; Nanomechanics, Inc., United States.

BM6.10.41

Periodically Microstructured Bio-Inspired Composites with On-Demand Energy Dissipation Properties Hortense Le Ferrand, Florian Bouville and Andre R. Studart; ETH Zurich, Switzerland.

BM6.10.42

The Extended Core Coax—A Novel Lab-on-a-Chip for Electrochemical Detection of Infectious Disease Biomarkers Amy Valera, Luke D'Imperio, Roger Fleischmann, Michael J. Naughton and Thomas Chiles; Boston College, United States.

BM6.10.43

Water-Stable PEDOT:PSS/PAAm Nanofiber for Super-Sensitive Ion Sensor Gwang Mook Choi, Yoo-Yong Lee, Seung-Min Lim, Jeong-Yun Sun and Young-chang Joo; Seoul National University, Korea (the Republic of).

SESSION BM6.11: Biomineralization
Session Chairs: Derk Joester and Ullrich Steiner
Thursday Morning, December 1, 2016
Hynes, Level 2, Room 200

8:30 AM *BM6.11.01

Controlling Crystallization Using Confinement—A Bio-Inspired Approach Yun-Wei Wang, Yi-Youun Kim, Shunbo Li, Clara Canto-Anduix, Xiuqing Gong, Hugo Christenson and Fiona C. Meldrum; University of Leeds, United Kingdom.

9:00 AM BM6.11.02

Oriented Crystallization of Barite in Hierarchical Biomaterial Vivian Merk^{1,2}, John K. Berg^{1,2}, Christina Krywka³ and Ingo Burgert^{1,2}; ¹ETH Zurich, Switzerland; ²Swiss Federal Laboratories for Material Science and Technology, Switzerland; ³Helmholtz-Zentrum Geesthacht, Germany.

9:15 AM BM6.11.03

Enhanced Properties through Non-Equilibrium Compositions—A Biomineralization Approach Michael Whittaker¹, Wenhao Sun², Gerbrand Ceder² and Derk Joester¹; ¹Northwestern University, United States; ²University of California, Berkeley, United States.

9:30 AM BM6.11.04

Rheology for In Situ Characterization of Bioinspired Mineralization in Hydrogels Abigail Regitsky¹, Bavand Keshavarz², Gareth McKinley² and Niels Holten-Andersen¹; ¹Massachusetts Institute of Technology, United States; ²Massachusetts Institute of Technology, United States.

9:45 AM BM6.11.05

Mechanical Spectroscopy of Retina Explants at the Protein Level Employing Nanostructured Scaffolds Mareike Zink¹ and Stefan G. Mayr²; ¹Leipzig University, Germany; ²Leibniz Institute of Surface Modification (IOM) e.V., Germany.

10:00 AM BREAK

SESSION BM6.12: Novel Approaches for the Fabrication and Characterization of Bioinspired Materials—Functional Bioderived Materials
Session Chairs: Bruno Frka-Petesic and Fiona Meldrum
Thursday Morning, December 1, 2016
Hynes, Level 2, Room 200

10:30 AM *BM6.12.01

Smart Nanomaterials from Diatoms Microalgae and Functional Organic Molecules Gianluca M. Farinola¹, Stefania M. Cicco², Danilo Vona¹, Marco Lopresti¹, Gabriella Leone¹, Maria Ada Bonifacio¹, Elvira De Giglio¹ and Roberta Ragni¹; ¹Dipartimento di Chimica Università degli Studi di Bari Aldo Moro, Italy; ²CNR ICCOM Bari, Italy.

11:00 AM BM6.12.02

A Cartilage-Inspired Lubrication System George W. Greene^{1,2,3}, Anna Olszewska³, Monika Osterberg³ and Roger Horn¹; ¹Deakin University, Australia; ²Australian Centre of Excellence in Electromaterials Science, Australia; ³Aalto University, Finland.

11:15 AM BM6.12.03

Mechanically Modulated, Ultra-High Precision Logic Delivery by Bio-Inspired Macroporous Ceramic Sponge Changlu Xu, Zhihao Wei, Yanjie Bai, Huilin Yang and Lei Yang; Soochow University, China.

11:30 AM BM6.12.04

High-Performance Rotary Micromachines Based on Biomaterials and Their Applications in Microfluidics Kwanoh Kim¹, Zexi Liang², Minliang Liu^{1,3} and Donglei (Emma) Fan^{1,2}; ¹University of Texas at Austin, United States; ²University of Texas at Austin, United States; ³Georgia Institute of Technology, United States.

11:45 AM BM6.12.05

Bio-Inspired Brilliant White Polymeric Nanoporous Thin Films Julia Syurik¹, Radwanul Hasan Siddique², Antje Dollmann¹, Guillaume Gomard^{1,3}, Marc Schneider¹, Matthias Worgull¹, Gabriele Wiegand⁴ and Hendrik Hoelscher¹; ¹Karlsruhe Institute of Technology, Germany; ²California Institute of Technology, United States; ³Karlsruhe Institute of Technology, Germany; ⁴Karlsruhe Institute of Technology, Germany.

SESSION BM6.13: Novel Approaches for the Fabrication and Characterization of Bioinspired Materials—Nanoscale Structures
Session Chairs: Stoyan Smoukov and Bodo Wiltz
Thursday Afternoon, December 1, 2016
Hynes, Level 2, Room 200

1:30 PM *BM6.13.01

Surface Texturing at the Micron and Nano-Scales by Laser Techniques for the Control of Cell Adhesion and Migration M. Martinez-Calderon¹, M. Manso-Silvan², A. Rodriguez¹, M. Gomez-Aranzadi¹, J.P. Garcia-Ruiz³, S.M. Olazola¹ and R.J. Martin-Palma²; ¹University of Navarra, Spain; ²Universidad Autónoma de Madrid, Campus de Cantoblanco, Spain; ³Universidad Autónoma de Madrid, Spain.

2:00 PM BM6.13.02

Moth Eyes for Solar Fuel Cells—Tuning the Light Absorption of Photoelectrodes at the Mesoscale Artur Braun^{1,2}, Florent Boudoire^{1,2}, Jakob Heier¹, Edwin Constable² and Rita Toth¹; ¹Swiss Federal Laboratories for Materials Science and Technology, Switzerland; ²University of Basel, Switzerland.

2:15 PM BM6.13.03

Characterize the Self-Assembly of Designed Helical Repeat Protein on Mica via Atomic Force Microscopy Shuai Zhang^{1,3}, Harley Pyles², David Baker^{2,3,4} and James J. De Yoreo¹; ¹Pacific Northwest National Laboratory, United States; ²University of Washington, United States; ³University of Washington, United States; ⁴University of Washington, United States.

2:30 PM BM6.13.04

Design and Realization of 3D Printed AFM Probes Nourin Alsharif, Anna Burkatovsky, Charles Lissandrello, Alice E. White and Keith A. Brown; Boston University, United States.

2:45 PM BM6.13.05

Directed Molecular Collection by Bio-Inspired Micro-Scale Chemical Potential Gradient Shiyang Zhang¹, Spencer Joseph Kieffer², Andrew Alleyne² and Paul V. Braun¹; ¹University of Illinois at Urbana Champaign, United States; ²University of Illinois at Urbana Champaign, United States.

3:00 PM BREAK

SYMPOSIUM BM7

SESSION BM6.14: Novel Approaches for the Fabrication and Characterization of Bioinspired Materials—Nanoparticles
Session Chairs: Hendrik Hoelscher and R.J. Martin-Palma
Thursday Afternoon, December 1, 2016
Hynes, Level 2, Room 200

3:30 PM *BM6.14.01

Unconventional Routes to Smart Materials Stoyan K. Smoukov; University of Cambridge, United Kingdom.

4:00 PM BM6.14.03

DNA Programmed Epitaxy of Nanoparticle Superlattices Robert Macfarlane; Massachusetts Institute of Technology, United States.

4:15 PM BM6.14.04

Virus-Mimicking Nanoparticles—Boosting Drug Delivery Efficacy via Tuning Nanoparticle's Elasticity Using Microfluidics Platform Mohammad Mahdi Hasani-Sadrabadi^{1,2,3}, Shirin Soleimani⁶, Fatemeh S. Majedi⁴, Erfan Dashtimoghdam⁵, Alireza Moshaverinia² and Karl Jacob¹; ¹Georgia Institute of Technology, United States; ²University of California, Los Angeles, United States; ³University of California, Los Angeles, United States; ⁴University of California, Los Angeles, United States; ⁵Marquette University, United States; ⁶University of Calgary, Canada.

4:30 PM BM6.14.05

Nanostructured Hybrid Materials by Self-Assembly of Nanoparticles Induced for Biomolecules Luiz F. Gorup^{2,1}, Andressa M. Kubo², Luciana S. Amaral², Edson R. Filho², Edson R. Leite², Elson Longo² and Emerson R. Camargo²; ¹University of Michigan, United States; ²Federal University of São Carlos, Brazil.

4:45 PM BM6.14.06

Durable Optical Reflectors with Angle-Independent Structural Colors and Fast Healing Property Xi Yao and Meijin Liu; City University of Hong Kong, Hong Kong.

Functional Nanostructured Polymers for Emerging Energy Technologies
November 28 - December 1, 2016

Symposium Organizers

Haiqing Lin, SUNY Buffalo
Ho Bum Park, Hanyang University
Guihua Yu, University of Texas-Austin

All journals in the MRS portfolio welcome submissions based on the individual presentations at the 2016 MRS Fall Meeting. Papers submitted and accepted for publication in MRS Advances (www.mrs.org/mrs-advances) will be available as collections of the symposia. Visit the MRS/Cambridge University Press Publications Booth #100 in the Exhibit Hall to learn more about MRS Advances, including print options available at special rates during the meeting week only.

* Invited Paper

SESSION BM7.1: Charged Membranes for Water Purification
Session Chairs: Yifu Ding and Haiqing Lin
Monday Morning, November 28, 2016
Hynes, Level 2, Room 202

8:00 AM *BM7.1.01

Ion Solubility, Diffusion, Permeation and Conductivity in Charged Polymers Benny D. Freeman; University of Texas at Austin, United States.

8:30 AM BM7.1.02

Facile Construction of Anion Exchange Membranes with 3D Interconnected Ionic Nano-Channels by the Self-Organization of Polymerizable Ionic Liquid Xinpei Gao and Liqiang Zheng; Shandong University, China.

8:45 AM BM7.1.03

Adhesive Interaction of Polyzwitterion Brushes Containing Inverse Phosphorylcholine Group Motoyasu Kobayashi; Kogakuin University, Japan.

9:00 AM BM7.1.04

Water-Polymer Distribution and Mobility in Hydrated Aromatic Ionomers under Confinement Shudipto K. Dishari^{1,3}, Christopher Rumble¹, Mark Maroncelli¹, Joseph Dura² and Michael Hickner¹; ¹The Pennsylvania State University, United States; ²National Institute of Standards and Technology, United States; ³University of Nebraska—Lincoln, United States.

9:15 AM BM7.1.05

Exploration of Zwitterionic Hydrogels for Desalination and Energy Production from Salt Waters by Mechanical Stress Sui Zhang^{1,2} and Rohit Karnik¹; ¹Massachusetts Institute of Technology, United States; ²National University of Singapore, Singapore.

9:30 AM BREAK

10:00 AM *BM7.1.06

Ion Containing Block Copolymers for Emerging Energy Applications Carl L. Willis; Kraton Polymers, United States.

10:30 AM BM7.1.07

Self-Cleaning Membranes from Comb-Shaped Copolymers with Photoresponsive Side Groups Papatya Kaner, Xiaoran Hu, Samuel W. Thomas and Ayse Asatekin; Tufts University, United States.

10:45 AM BM7.1.08

Inverse Opal-Templated Multiscale Architected Nanomembranes with Tunable Separation Properties Pil Jin Yoo; Sungkyunkwan University, Korea (the Republic of).

11:00 AM BM7.1.09

Fabrication of Hierarchically Porous Membranes by Photofluidization of Azopolymers for Oil/Water Separation Hong Suk Kang and Shu Yang; University of Pennsylvania, United States.

Final Technical Report to the Army Research Office

Symposium EM7: Functional Plasmonics, MRS Fall Conference 2016

Organizers: **Laura Na Liu** (Max Planck Institute for Intelligent Systems), **Prashant K. Jain** (University of Illinois at Urbana-Champaign), **Yongmin Liu** (Northeastern University), **Yuebing Zheng** (University of Texas at Austin)

This symposium at the 2016 MRS Fall meeting aimed at bringing together researchers from physics, chemistry, biology, and materials science to share recent breakthroughs in functional plasmonics, identify critical issues, exchange ideas, and outline future directions. We organized a symposium that covered a broad range of topics related to functional plasmonics.

Highlights: Our well-structured program attracted various contributions to fundamental theory and new concepts, emerging nanofabrication techniques, new materials and architectures, novel devices, and applications. Our five-and-half day programme, including one half-day tutorial with 3 distinguished lecturers and five-day technical sessions with 19 invited speakers, was successful. An extensive $\frac{1}{2}$ day tutorial on “The Principle of Functional Plasmonics” engaged researchers and students who are interested in this field and at different levels. We had about 110 oral presentations and 70 poster presentations with more than 180 participants.

This symposium provided a discussion forum to address a diverse expertise and application focus being developed around the overarching field of plasmonics. Following fast development in several decades, plasmonics has stepped into a new horizon, where not only the intriguing optical properties of plasmonic structures and systems matter, but also their functionalities, especially promising applications in different disciplines, are of paramount importance. Our program led to a better understanding of the profound properties from the molecular to submicron level, which opened a new pathway to designing functional plasmonic materials and devices. The developments of functional plasmonics will continue to be strong. The combination of knowhow in plasmonics and different disciplines will further advance the fundamental understanding of light-matter interaction and the real-life applications, such as super-resolution imaging, biomedical sensing and energy harvesting.

ARO grant to our symposium was used to partially support most of our invited speakers and tutorial instructors (more details in financial report).

10:45 AM *EM6.9.06

The Carbon Nanotube Enabled VFET: Developments Leading to a Full Aperture QVGA AMOLED Andrew G. Rinzler¹, Mitchell A. McCarthy^{1,2}, Bo Liu^{1,2}, David J. Cheney^{1,2}, Maxime G. Lemaître^{1,2}, Ramesh Jayaraman^{1,2}, Mallory Mativenga³, Di Geng³, Jeonggi Kim³, Hyo Min Kim³ and Jin Jang³; ¹University of Florida, United States; ²nVerPix LLC, United States; ³Kyung Hee University, Korea (the Republic of).

11:15 AM EM6.9.07

On the Way to System Integration—A Fully-Printed All-Polymer Twilight Switch Giorgio Dell'Erba, Andrea Perinot and Mario Caironi; Istituto Italiano di Tecnologia, Italy.

11:30 AM *EM6.9.08

Tribotronics—A New Field by Coupling Triboelectricity and Semiconductor Chi Zhang¹ and Zhong Lin Wang^{1,2}; ¹Beijing Institute of Nanoenergy and Nanosystems, Chinese Academy of Sciences, China; ²Georgia Institute of Technology, United States.

SESSION EM6.10: Novel TFT Materials and Structures
Session Chair: Moon Sung Kang
Thursday Afternoon, December 1, 2016
Hynes, Level 3, Room 312

1:30 PM EM6.10.01

Novel N-Type Semiconductor for OLET Applications Caterina Soldano¹, Mitchell Denti² and Antonio Facchetti²; ¹ETC s.r.l., Italy; ²Polyera Corp., United States.

1:45 PM EM6.10.02

Wrinkled MoS₂ Field-Effect Transistor Shikai Deng and Vikas Berry; University of Illinois at Chicago, United States.

2:00 PM EM6.10.03

Contact-Controlled Heterostructure Thin-Film Transistors—Interplay of Carrier Mobility and Contact Barrier Radu A. Sporea, K.D.G.I. Jayawardena, Marios Constantinou, Munroe Ritchie, Alistair Brewin, William Wright and S. R. Silva; University of Surrey, United Kingdom.

2:15 PM EM6.10.04

Split-Gate Ambipolar Thin-Film Transistors and Circuits Hoecheon Yoo¹, Fabrizio Torricelli², Matteo Ghittorelli², Edsger Smits³, Gerwin Gelinck³ and Jae Joon Kim¹; ¹Pohang University of Science and Technology, Korea (the Republic of); ²University of Brescia, Italy; ³Holst Centre, Netherlands.

2:30 PM EM6.10.05

N-Type Conduction Induced by Cation Site Doping in Layered Tin Monoxide—Materials Characterizations and Thin-Film Transistors Kun Tian and Ashutosh Tiwari; University of Utah, United States.

2:45 PM BREAK

3:15 PM EM6.10.06

Sheet Resistance Reduction of a-IGZO by Oxygen Vacancy Control Using Low Temperature Excimer Laser Irradiation Juan Paolo S. Bermundo¹, Yasuaki Ishikawa¹, Mami N. Fujii¹, Hiroshi Ikenoue² and Yukiharu Uraoka¹; ¹Nara Institute of Science and Technology, Japan; ²Kyushu University, Japan.

3:30 PM EM6.10.07

Electric Field-Induced Transport Modulation in Correlated Oxide VO₂-FETs with High- k Ta₂O₅/Organic Parylene-C Hybrid Gate Teruo Kanki, Tingting Wei and Hidekazu Tanaka; Osaka University, Japan.

3:45 PM EM6.10.08

Developing Structure-Property Relationships in Amorphous Transparent Conducting Oxides through Local Structure Studies of the In-Ga-O System Stephanie L. Moffitt, Qimin Zhu, Qing Ma, D. B. Buchholz, Robert P. Chang, Thomas O. Mason, Tobin J. Marks and Michael J. Bedzyk; Northwestern University, United States.

SYMPOSIUM EM7

Functional Plasmonics
November 28 - December 2, 2016

Symposium Organizers

Prashant K. Jain, University of Illinois - Urbana Champaign
Laura Na Liu, Max Planck Institute for Intelligent Systems
Yongmin Liu, Northeastern University
Yuebing Zheng, University of Texas-Austin

All journals in the MRS portfolio welcome submissions based on the individual presentations at the 2016 MRS Fall Meeting. Papers submitted and accepted for publication in MRS Advances (www.mrs.org/mrs-advances) will be available as collections of the symposia. Visit the MRS/Cambridge University Press Publications Booth #100 in the Exhibit Hall to learn more about MRS Advances, including print options available at special rates during the meeting week only.

* Invited Paper

TUTORIAL

The Fundamentals, Advanced Fabrication Approaches and Novel Applications of Functional Plasmonics

8:30 AM - 12:00 PM
Sunday Morning, November 27, 2016
Hynes, Level 2, Room 209

Following fast development in several decades, plasmonics has stepped into a new horizon, where not only the intriguing optical properties of plasmonic structures and systems matter but also their functionalities, especially promising applications in different spectral regimes are of paramount importance. A better understanding of the profound properties from the molecular to submicron level opens a new pathway to designing functional plasmonic materials and devices.

This tutorial will focus on both the fundamentals and applications of functional plasmonics from the visible to the microwave regime. The tutorial will be divided into three parts.

Part One: Andrea Alù

Overview of the Physics and Development of Plasmonics

Prof. Alù will discuss the most recent theoretical and experimental results, including plasmonic nanostructures and metasurfaces to control wave propagation, scattering, and radiation, large nonreciprocal responses without magnetic bias, active meta-atoms, and metasurfaces. Physical insights into these exotic phenomena, new devices based on these concepts, and their impact on technology will be discussed during the talk. He will also outline the exciting venues for functional devices in the microwave and optical regime.

Part Two: Harald Giessen

Advanced Top-Down Fabrications and Applications of Functional Plasmonics in the Near-Infrared and Visible Regimes

Prof. Giessen will discuss advanced top-down fabrications and applications of functional plasmonics in the near-infrared and visible regimes, which provide a promising path to practicality. Complex plasmonic structures allow for tailoring resonances and functionality. Gold and silver with atomically flat surfaces and single crystalline atomic arrangements represent ultimate material quality. Hybrid materials enable chiral as well as nonreciprocal responses. Active switching is enabled by phase change materials as well as metal-to-insulator transitions. New materials for plasmonics include Yttrium and its hydrides, refractory materials such as TiN, as well as the highly reactive magnesium, whose particle plasmons can be switched on and off by hydrogen and oxygen. Novel fabrication methods such as two-photon femtosecond direct laser writing, colloidal-etching lithography and interference lithography allow for low-cost and large-area fabrication of functional plasmonic devices.

Part Three: Oleg Gang

Advanced Bottom-Up Fabrications using DNA Nanotechnology for Functional Plasmonics in the Visible Regime

Dr. Gang will provide insights into the DNA-driven assembly of optically active nano-objects into well-defined architectures: ideas, methods, and realizations. Approaches based on self-assembly offer tremendous advantages in nanomaterial fabrication and address tasks that are intrinsically difficult for conventional

fabrication methods. He will present DNA assembly of plasmonic clusters and extended arrays from nanoscale components of multiple types driven by DNA recognition, chain effects and geometrical factors. Based on the expertise in assembly, optical and mechanical effects in plasmonic nanosystems can be controlled well and this allows for rationalizing all aspects of nanomaterial fabrication.

Instructors

Andrea Alù, The University of Texas at Austin

Harald Giessen, University of Stuttgart

Oleg Gang, Brookhaven National Laboratory

SESSION EM7.1: Functional Plasmonics for Novel Optical Effects I

Session Chair: Prashant K. Jain

Monday Morning, November 28, 2016

Hynes, Level 3, Ballroom A

8:45 AM *EM7.1.01

Demonstration of Optical Metamaterials with Isotropic Negative Index

Sui Yang^{1,2,3}, Xingjie Ni¹, Boubacar Kante¹, Jie Zhu¹, Kevin O'Brien¹, Yuan Wang^{1,3} and Xiang Zhang^{1,2,3}; ¹University of California, Berkeley, United States; ²University of California, United States; ³Lawrence Berkeley National Laboratory, United States.

9:15 AM EM7.1.02

Optical Isolation in Quadratically Nonlinear Photonic Nanostructures

Artur Davoyan^{2,3,1} and Harry A. Atwater^{2,3,1}; ¹California Institute of Technology, United States; ²Resnick Sustainability Institute, United States; ³Kavli Nanoscience Institute, United States.

9:30 AM EM7.1.03

Direct Imaging of Acoustic Modes in Plasmonic Nanoparticles with Ultrafast Electron Microscopy David T. Valley, Dana Dement, Vivian Ferry and David J. Flannigan; University of Minnesota Twin Cities, United States.

9:45 AM EM7.1.04

Direct Writing of Optical Metamaterials on Novel Substrates Using Atomic

Calligraphy Thomas Stark, Lawrence K. Barrett, Jeremy Reeves, Richard Lally and David Bishop; Boston University, United States.

10:00 AM EM7.1.05

Resonant Thermoelectric Nanophotonics Kelly W. Mauser, Slobodan Mitrovic, Seyoon Kim, Dagny Fleischman and Harry A. Atwater; California Institute of Technology, United States.

10:15 AM BREAK

10:45 AM *EM7.1.06

Programmable Multi-Scale Nanoparticle Metasurfaces Teri W. Odom; Northwestern University, United States.

11:15 AM EM7.1.07

Evolutionary Algorithms for Designing Achromatic Plasmonic Lattice Lenses Jingtian Hu, Xiaochen Ren, Lincoln J. Lauhon and Teri W. Odom; Northwestern University, United States.

11:30 AM EM7.1.08

Metal Alloys for Plasmonic Applications Chen Gong, Mariama Dias and Marina S. Leite; University of Maryland, United States.

11:45 AM EM7.1.09

Nano-Imprinted Hexagonal Hyperlens Array for High-Throughput Super-Resolution Imaging Dasol Lee¹, Yangdoo Kim², Hakjong Choi², Jungho Mun¹, Minkyung Kim¹, Heon Lee² and Junsuk Rho¹; ¹POSTECH, Korea (the Republic of); ²Korea university, Korea (the Republic of).

SESSION EM7.2: Functional Plasmonics for Novel Optical Effects II

Session Chair: Laura Na Liu

Monday Afternoon, November 28, 2016

Hynes, Level 3, Ballroom A

1:30 PM *EM7.2.01

Chiral Plasmons and Controllable Quenching of Super-Radiance in 2D Systems Nicholas Fang; Massachusetts Institute of Technology, United States.

2:00 PM EM7.2.02

Tunable Plasmonic Pixels Using Electric Field Induced Alignment of Gold

Nanorods in Organic Suspensions Jake Fontana¹, Greice da Costa^{3,2}, Joao Pereira², Jawad Naciri¹, Banahalli Ratna¹, Peter Palfy-Muhoray⁴ and Isabel Carvalho²; ¹Naval Research Lab, United States; ²Pontificia Universidade Catolica do Rio de Janeiro (PUC-Rio), Brazil; ³Federal do Rio de Janeiro, Brazil; ⁴Kent State University, United States.

2:15 PM EM7.2.03

Multi-Spectral Fractal Plasmonics for Surface-Enhanced Spectroscopy

Ekin Aslan^{1,2}, Erdem Aslan^{1,2}, Ren Wang¹, Mi K. Hong³, Shyamsunder Erramilli^{3,4,5}, Mustafa Turkmen², Oemer G. Saracoglu² and Luca Dal Negro^{1,4}; ¹Boston University, United States; ²Erciyes University, Turkey; ³Boston University, United States; ⁴Boston University, United States; ⁵Boston University, United States.

2:30 PM BREAK

3:00 PM *EM7.2.04

Enhancing Plasmonics and Flat Optics with Novel Material Platforms

Alexandra Boltasseva¹, K. Chaudhuri¹, Urcan Guler¹, N. Kinsey¹, Jongbum Kim¹, C. DeVault², S. Choudhuri¹, A. Dutta¹ and Vladimir M. Shalaev¹; ¹Purdue University, United States; ²Purdue University, United States.

3:30 PM EM7.2.05

Simulated Raman Correlation Spectroscopy (SRCS) for Atomic Binding

Analysis of Cytosine-Silver Complexes Lindsay M. Freeman, Alexei Smolyaninov, Lin Pang and Yeshaiah Fainman; University of California, San Diego, United States.

3:45 PM EM7.2.06

High-Resolution Bubble Printing of Quantum Dots on Plasmonic

Substrates Bharath Bangalore Rajeeva, Linhan Lin, Evan Perillo, Xiaolei Peng, Andrew Dunn and Yuebing Zheng; University of Texas at Austin, United States.

4:00 PM EM7.2.07

Hybridization between Nano Cavities for Polarimetric Color Sorter at

the Sub-Micron Scale Elad Segal¹, Adam Weissman¹, David Gachet² and Adi Salomon¹; ¹Bar-Ilan University, Israel; ²Attolight Company, Swaziland.

4:15 PM EM7.2.08

Vivid Ultraviolet Structural Color Generation by Aluminum Nanodisk

Array Chun-Ho Lee¹, Youngrok Kim², Jung-Hwan Song¹, Ho-Seok Ee³, Kwang-Yong Jeong³, Min-Soo Hwang³, Hong-Gyu Park³, Takhee Lee² and Min-Kyo Seo¹; ¹Korea Advanced Institute of Science and Technology, Korea (the Republic of); ²Seoul National University, Korea (the Republic of); ³Korea University, Korea (the Republic of).

4:30 PM EM7.2.09

Plasmonic Hot Electrons Driven Photocatalytic Reactions—New Insights

Gained from Plasmon-Enhanced Spectroscopic Studies Qingfeng Zhang¹, Yadong Zhou², Shengli Zou² and Hui Wang¹; ¹University of South Carolina, United States; ²University of Central Florida, United States.

4:45 PM EM7.2.10

Wavelength- and Temperature-Tunable Ultra-Thin Perfect Absorbers

Using Ion Beam Irradiation Jura Rensberg¹, Chenghao Wan², Steffen Richter³, You Zhou⁴, Shuyan Zhang⁴, Schmidt-Grund Ruediger³, Shriram Ramanathan⁵, Federico Capasso⁴, Mikhail A. Kats^{2,6} and Carsten Ronning¹; ¹Friedrich Schiller University Jena, Germany; ²University of Wisconsin - Madison, United States; ³Leipzig University, Germany; ⁴Harvard University, United States; ⁵Purdue University, United States; ⁶University of Wisconsin - Madison, United States.

SESSION EM7.3: Hot Carrier Generation and Active Plasmonics I

Session Chair: Yuebing Zheng

Tuesday Morning, November 29, 2016

Hynes, Level 3, Ballroom A

8:30 AM *EM7.3.01

Quantum Plasmonics and Hot-Electron Induced Processes Peter Nordlander; Rice University, United States.

9:00 AM EM7.3.02

Generation of Hot Electrons Using Plasmonic Nanostars Xiang-Tian Kong^{1,2}

, Zhiming Wang¹ and Alexander O. Govorov²; ¹University of Electronic Science and Technology of China, China; ²Ohio State University, United States.

9:15 AM EM7.3.03

Surface Plasmon Polariton-Induced Hot Carrier Generation for Photocatalysis Wonmi Ahn, Daniel Ratchford, Pehr Pehrsson and Blake S. Simpkins; U.S. Naval Research Laboratory, United States.

9:30 AM EM7.3.04

Material Opportunities and Device Applications for Hot Carrier Plasmonics Tao Gong, Lisa Krayner and Jeremy N. Munday; University of Maryland, United States.

9:45 AM EM7.3.05

Generation, Transport and Relaxation Dynamics of Non-Equilibrium Carriers in Plasmonic Devices Prineha Narang^{1,2}, Ravishankar Sundararaman¹, Adam S. Jernyn¹, William A. Goddard¹ and Harry A. Atwater¹; ¹California Inst of Technology, United States; ²NG NEXT, United States.

10:00 AM BREAK

10:30 AM *EM7.3.06

Correlating Single Electron Transfer Events with Light Emission in Plasmonic Nanopore Arrays Donghoon Han¹, Kaiyu Fu¹ and Paul W. Bohn^{1,2}; ¹University of Notre Dame, United States; ²Notre Dame, United States.

11:00 AM EM7.3.07

Generation of Plasmonic Hot-Carriers in the UV-VIS Regime—Experimental Study of the Contribution of Inter- and Intra-Band Transitions Giulia Tagliabue, Prineha Narang, Ravishankar Sundararaman and Harry A. Atwater; California Inst of Technology, United States.

11:15 AM *EM7.3.08

Enhancing Plasmonic Functionality Using a Phase-Changing Metal Oxide Richard F. Haglund; Vanderbilt University, United States.

11:45 AM EM7.3.09

Tunable Metasurfaces Based on Vanadium Dioxide Zhihua Zhu¹, Philip Evans², Richard F. Haglund³ and Jason Valentine⁴; ¹Vanderbilt University, United States; ²Oak Ridge National Laboratory, United States; ³Vanderbilt University, United States; ⁴Vanderbilt University, United States.

SESSION EM7.4: Hot Carrier Generation and Active Plasmonics II
Session Chair: K. Lindfors
Tuesday Afternoon, November 29, 2016
Hynes, Level 3, Ballroom A

1:30 PM *EM7.4.01

Active and Nonlinear Plasmonic Devices and Components Naomi J. Halas; Rice University, United States.

2:00 PM EM7.4.02

Mechanically Tunable Metasurfaces on Stretchable Substrates—Optical Zoom Lens and Switchable Holograms Ho-Seok Ee, Stephanie Malek and Ritesh Agarwal; University of Pennsylvania, United States.

2:15 PM EM7.4.03

Electrically Tunable Epsilon-Near-Zero (ENZ) ITO Plasmonic Modulators Yu Wang¹, HongWei Zhao², Jonathan Klamkin² and Luca Dal Negro¹; ¹Boston University, United States; ²University of California Santa Barbara, United States.

2:30 PM EM7.4.04

Coupling of Localized Surface Plasmons to Excitons in Self-Organized InAs Quantum Dots Vladimir V. Chaldyshev^{1,2}, Nikita Toropov³, Igor Gladskikh³, Polina Gladskikh³, Valeriy Preobrazhenskiy⁴, Mikhail Putyato⁴, Boris Semyagin⁴, Alexander Kosarev^{1,2}, Alexey Kondikov^{1,2} and Tigran Vartanyan³; ¹Ioffe Institute, Russian Federation; ²St. Petersburg Polytechnic University, Russian Federation; ³ITMO University, Russian Federation; ⁴Institute of Semiconductor Physics, Russian Federation.

2:45 PM BREAK

3:15 PM EM7.4.05

Thermally Induced Surface Plasmons in Graphene Nanodisk Array Francisco V. Ramirez, Sheng Shen and Alan McGaughey; Carnegie Mellon University, United States.

3:30 PM EM7.4.06

Tunable Graphene-Based Metamaterial Mirrors for Enhancement and Suppression of Raman Signal Vrinda Thareja¹, Mark L. Brongersma¹ and Pieter G. Kik²; ¹Stanford University, United States; ²University of Central Florida, United States.

3:45 PM EM7.4.07

Directed Assembly of Charge-Transfer Metamolecules Jake Fontana, Nicholas Charipar, Steven R. Flom, Jawad Naciri, Alberto Pique and Banahalli Ratna; Naval Research Lab, United States.

4:00 PM EM7.4.08

Coupling-Enhanced Broadband Mid-Infrared Light Absorption in Graphene Plasmonic Nanostructures Bingchen Deng¹, Qiushi Guo¹, Xi Ling², Jing Kong² and Fengnian Xia¹; ¹Yale University, United States; ²Massachusetts Institute of Technology, United States.

4:15 PM EM7.4.09

Ultra-Sensitive Singular-Phase Optical Detection with Topologically Protected Tamm Plasmon Resonances Svetlana V. Boriskina¹, Jonathan Tong¹, Yoichiro Tsurimaki¹, Victor Boriskin², Alexander Semenov³, Mykola I. Ayzatskiy², Yuri P. Machekhin⁴ and Gang Chen¹; ¹Massachusetts Institute of Technology, United States; ²National Scientific Center 'Kharkiv Institute of Physics and Technology', Ukraine; ³Institute for Single Crystals NASU, Ukraine; ⁴Kharkiv National University of Radio Electronics, Ukraine.

4:30 PM EM7.4.10

Coherent Control of High-Efficiency Beam Bending Metasurfaces Shota Kita^{1,2}, Kenta Takata^{1,2}, Masaaki Ono^{1,2}, Kengo Nozaki^{1,2}, Eiichi Kuramochi^{1,2} and Masaya Notomi^{1,2}; ¹Nanophotonic center, NTT, Japan; ²NTT BRL, NTT, Japan.

4:45 PM EM7.4.11

Strong Coupling between Surface Plasmons and Excitons in Conjugated Polymers Christopher Petoukhoff¹ and Deirdre O'Carroll^{1,2}; ¹Rutgers University, United States; ²Rutgers University, United States.

SESSION EM7.5: Poster Session I: Functional Plasmonics
Tuesday Afternoon, November 29, 2016
8:00 PM - 10:00 PM
Hynes, Level 1, Hall B

EM7.5.01

Significant Surface Plasmons-Induced Enhancement of Yellow-Green Light Emission of ZnO Nanorod Arrays by Photochemical Decoration of Ag Nanoparticles Hyeon-Ho Park¹, Hae-Yong Jeong¹, Xin Zhang², Ahum Sohn³, Dong-Wook Kim³, Joondong Kim⁴, Kyung Ho Park¹ and Won-Kyu Park¹; ¹Korea Advanced Nano Fab Center, Korea (the Republic of); ²Simon Fraser University, Canada; ³Ewha Womans University, Korea (the Republic of); ⁴Incheon National University, Korea (the Republic of).

EM7.5.02

Investigation of the Au/TiO₂ (320) Interface by Optical Second Harmonic Generation Technique Haque MD Ehasanul¹, Daiki Kobayashi¹, Yuki Tomatsu¹, Khuat Thi Thu Hien¹, Goro Mizutani¹ and Harvey N. Rutt²; ¹Japan Advanced Institute of Science and Technology, Japan; ²University of Southampton, United Kingdom.

EM7.5.03

Fabrication of Deep Sub-Wavelength 3D Metamaterials and Metadevices Using High-Accuracy Electron-Beam Lithography Overlay Process Inki Kim¹, Gwanho Yoon¹, Minkyung Kim¹, Sunae So¹, Jungho Mun² and Junsuk Rho^{1,2}; ¹Pohang University of Science and Technology, Korea (the Republic of); ²Pohang University of Science and Technology, Korea (the Republic of).

EM7.5.04

Graphene-Mediated SERS (GERS)—Highly-Sensitive 2D and 3D Graphene Decorated with Ag and Au Nanoparticles as Smart Chemical Sensing Platforms Sanju Gupta and Tyler Smith; Western Kentucky University, United States.

EM7.5.05

Fabrication of Nanojunction with Sub-10 nm Nanogap by Tensile Stress Mechanically Breaking for Surface Enhanced Raman Scattering Junjie Li, Baogang Quan, Yujin Wang and Changzhi Gu; Institute of Physics Chinese Academy of Sciences, China.

EM7.5.06

Nitridation of TiO₂ Thin Films and Patterned Nanostructures for Plasmonic Applications Irene R. Howell¹, Baptiste Giroire², Cyril Aymonier² and James J. Watkins¹; ¹University of Massachusetts-Amherst, United States; ²Université de Bordeaux, France.

EM7.5.07

Using Tailored Plasmonic Photocatalysts for Carbon Dioxide Hydrogenation Xueqian Li, Jie Liu, Xiao Zhang and Henry Everitt; Duke University, United States.

EM7.5.08

Optical Properties of the Cu-Zn Brasses and Possible Use of β' Phase in Plasmonic Applications Kaludewa S. De Silva¹, Vicki Keast² and Michael Cortie¹; ¹University of Technology, Australia; ²The University of Newcastle, Australia.

EM7.5.09

Control of Chemiluminescence by Nonlocal Dielectric Environments Vanessa N. Peters, C. Yang and Mikhail Noginov; Norfolk State University, United States.

EM7.5.10

Insulin Sensing Using Surface-Enhanced Raman Spectroscopy Hyunjun Cho¹, Daejong Yang², Shailabh Kumar² and Hyuck Choo^{1,2}; ¹California Institute of Technology, United States; ²California Institute of Technology, United States.

EM7.5.11

One-Step Synthesis of SERS Active Gold Nanoparticles Using Water-Soluble Carboxylated Tetrathiafulvalene Vinyllogues Jiaqi Cheng, Sepideh Mehrani, Yunfei Wang, Yuming Zhao and Erika Merschrod; Memorial University of Newfoundland, Canada.

EM7.5.12

Integrated Metaphotonics—Symmetries Analysis for Confined Excitation of LSP Resonances in Metallic Nanoparticles Ricardo Tellez Limon, Babak Bahari, Liyi Hsu, Jun-Hee Park, Ashok Kodigala and Boubacar Kante; University of California San Diego, United States.

EM7.5.13

Quantum State Absorptions Coupled to Resonance Raman Spectroscopy Could Result in a General Explanation of TERS from Multiprobe NSOM & Raman Scattering Zachary D. Schultz³, John Parthenios¹, Rimma Dekhter⁴, D. Anastopoulos¹, Spiridon Grammatikopoulos², Kostantinos Papagelis², James Marr³, Costas Galiotis², Dimtry Lev⁴ and Aaron Lewis⁴; ¹FORTH/ICE-HT, Greece; ²University of Patras, Greece; ³Notre Dame, United States; ⁴Hebrew University, Israel.

EM7.5.14

Synthesis of Three-Dimensional Gyroidal Bicontinuous Gold Nanostructures as Plasmonic Materials and Surfaces Ethan Susca, Peter Beaucage, Lara A. Estroff and Ulrich Wiesner; Cornell University, United States.

EM7.5.15

Terawatt Laser Functional Modulation of Plasmons in Nanoparticles Mina Nazari¹, Min Xi², Suryaram Gummuluru³, Mi K. Hong⁵, Bjoern M. Reinhard^{2,4} and Shyamsunder Erramilli^{5,4}; ¹Boston University, United States; ²Boston University, United States; ³Boston University School of Medicine, United States; ⁴Boston University, United States; ⁵Boston University, United States.

EM7.5.16

Indium Tin Oxide for Mid-Infrared Plasmonics Yu Wang¹, Adam Overvig², Sajjan Shrestha², NanFang Yu² and Luca Dal Negro¹; ¹Boston University, United States; ²Columbia University, United States.

SESSION EM7.6: Light Matter Interaction I

Session Chair: Andrea Baldi

Wednesday Morning, November 30, 2016

Hynes, Level 3, Ballroom A

8:30 AM *EM7.6.01

Plasmonic Nanoantennas for Wireless Signal Transmission K. Lindfors^{1,2,3}, Daniel Dregely^{2,3}, Markus Lippitz^{2,3,4}, Nader Engheta⁵, Michael Totzeck⁶ and H. Giessen³; ¹University of Cologne, Germany; ²Max Planck Institute for Solid State Research, Germany; ³University of Stuttgart, Germany; ⁴University of Bayreuth, Germany; ⁵University of Pennsylvania, United States; ⁶Carl Zeiss AG, Germany.

9:00 AM EM7.6.02

Wide-Angle, Broadband Graded Metasurface for Back Reflection Verena Neder¹, Nasim Mohammadi Estakhri², Mark W. Knight¹, Albert Polman¹ and Andrea Alu²; ¹FOM Institute AMOLF, Netherlands; ²The University of Texas at Austin, United States.

9:15 AM EM7.6.03

Large Capacity Holographic Multiplexing with Metasurface Lingling Huang; Beijing Institute of Technology, China.

9:30 AM EM7.6.04

All-Dielectric Conformal Metasurfaces for Lensing and Cloaking Jierong Cheng, Samad Jafar-Zanjani and Hossein Mosallaei; Northeastern University, United States.

9:45 AM EM7.6.05

Tip-Engineered Correlated Metasurfaces Using Quantum Materials Stephanie Gilbert Corder¹, Xinzhong Chen¹, Jiawei Zhang¹, Shaoqing Zhang², Jack Logan¹, Thomas Ciavatti¹, Hans Bechtel³, Michael Martin³, Meigan Aronson¹, Hiroyuki Suzuki⁴, Keiichiro Imura⁵, Noriaki K. Sato⁵, Tiger H. Tao² and M. K. Liu¹; ¹Stony Brook University, United States; ²University of Texas at Austin, United States; ³Lawrence Berkeley National Laboratory, United States; ⁴National Institute for Materials Science, Japan; ⁵Nagoya University, Japan.

10:00 AM BREAK

10:30 AM EM7.6.06

Coherent Control of the Optical Absorption and Fluorescence Enhancement in a Plasmonic Lattice Coupled to a Luminescent Layer Giuseppe Pirruccio^{1,2}, Mohammad Ramezani^{2,3,4}, Said Rahimzadeh-Kalaleh Rodriguez^{2,5} and Jaime Gomez Rivas^{2,3,4}; ¹Universidad Nacional Autonoma de Mexico, Mexico; ²FOM Institute AMOLF, Netherlands; ³Dutch Institute for Fundamental Energy Research, Netherlands; ⁴Eindhoven University of Technology, Netherlands; ⁵Laboratoire de Photonique et de Nanostructures, France.

10:45 AM EM7.6.07

Harnessing Molecule-Plasmon Interactions for Advanced Biosensing and Rewritable Hybrid Plasmonic Waveguides Mingsong Wang and Yuebing Zheng; University of Texas at Austin, United States.

11:00 AM EM7.6.08

Investigation of the Stimulated Emission of Surface Plasmon Polaritons by Colloidal Quantum Dots Incorporated into Plasmonic Resonators and Waveguides Over Large Chip Areas Jian Cui, Stephan J. Kress, Patrik Rohner, David Kim, Felipe Antolinez, Karl-Augustin Zaininger, Sriharsha V. Jayanti, Patrizia Richner, Dimos Poulikakos and David J. Norris; ETH Zurich, United States.

11:15 AM EM7.6.09

The Plasmonic Thermistor Daniel Tordera, Dan Zhao, Anton Volkov, Igor Zozoulenko, Xavier Crispin and Magnus P. Jonsson; Linköping University, Sweden.

11:30 AM EM7.6.10

Low Temperature Near Infrared Plasmonic Gas Sensing of Gallium and Aluminum Doped Zinc Oxide Thin Films from Colloidal Inks Marco Sturaro¹, Enrico Della Gaspera², Massimo Guglielmi¹ and Alessandro Martucci¹; ¹Università di Padova, Italy; ²MIT, Australia.

11:45 AM EM7.6.11

Topological Effect in THz Devices with High Functionality Babak Bahari and Boubacar Kante; UCSD, United States.

SESSION EM7.7: Light Matter Interaction II
Session Chair: Frank Neubrech
Wednesday Afternoon, November 30, 2016
Hynes, Level 3, Ballroom A

1:30 PM EM7.7.01

Scintillator Light Emission Enhancement via Nanostructure and Plasmonic Design Brooke Beckett, Jason H. Nadler, Jonathan Andreasen, Greg Mohler and Clayton Kerce; Georgia Tech Research Institute, United States.

1:45 PM EM7.7.02

Surface Plasmon Mediated Strong Coupling and Hybridization of Vibronic Transitions in Organic Molecules Rahul Deshmukh^{1,2}, Paulo Marques¹, Anurag Panda³, Stephen R. Forrest^{3,4,5} and Vinod Menon^{1,2}; ¹City College of New York, United States; ²Graduate Center of City University of New York, United States; ³University of Michigan, United States; ⁴University of Michigan, United States; ⁵University of Michigan, United States.

2:00 PM EM7.7.03

Control of Light Emission from Silicon Quantum Dots Coupled to Plasmonic Nanoantennas Hiroshi Sugimoto, Shiho Yashima and Minoru Fujii; Kobe University, Japan.

2:15 PM EM7.7.04

Plasmonic Quantum Dot Light Emitting Devices with Metal Oxide Charge Transport Layers Ramesh Vasan and Omar Manasreh; University of Arkansas, United States.

2:30 PM BREAK

3:30 PM EM7.7.05

A Mechanistic Investigation on Biexciton Emission Enhancement of Single Quantum Dots near Gold Nanoparticles Swayandipta Dey¹, David Kriz¹, Julie Jenkins¹, Shengli Zou², Ou Chen³, Steven L. Suib¹ and Jing Zhao¹; ¹University of Connecticut, United States; ²University of Central Florida, United States; ³Brown University, United States.

3:45 PM EM7.7.06

A Library of High-Q Planar Plasmonic Resonators for On-Chip Spasers Stephan Kress, Jian Cui, Kevin M. McPeak, Patrizia Richner, Patrik Rohner, Felipe Antolinez, Sriharsha V. Jayanti, David Kim, Karl-Augustin Zaininger, Dimos Poulikakos and David J. Norris; ETH Zurich, Switzerland.

4:00 PM EM7.7.07

Surface Plasmon-Enhanced Upconversion in Rare-Earth Doped Nanoparticles with Au Nanocaps Tatsuki Hinamoto, Hiroyuki Takashina and Minoru Fujii; Kobe University, Japan.

4:15 PM EM7.7.08

Manipulating Smith-Purcell Emission with Babinet Metasurfaces Zuojia Wang^{1,2}, Kan Yao³, Min Chen⁴, Hongsheng Chen¹ and Yongmin Liu^{2,3}; ¹Zhejiang University, China; ²Northeastern University, United States; ³Northeastern University, United States; ⁴Massachusetts Institute of Technology, United States.

4:30 PM *EM7.7.09

Atomistic Electrodynamics Simulations of Plasmonic Nanoparticles Lasse Jensen; The Pennsylvania State University, United States.

SESSION EM7.8: Poster Session II: Functional Plasmonics
Wednesday Afternoon, November 30, 2016
8:00 PM - 10:00 PM
Hynes, Level 1, Hall B

EM7.8.01

High Angular Tolerance Plasmonic Color Filter Based on Flat Metal Films Nayoung Kim and Jonghwa Shin; KAIST, Korea (the Republic of).

EM7.8.02

Single Particle Plasmon Sensors as Label-Free Technique to Monitor the Dynamics of MinDE Protein Wave on Membranes Weixiang Ye^{1,2}, Christina Lambert¹ and Carsten Soennichsen¹; ¹University of Mainz, Germany; ²Graduate School Materials Science in Mainz, Germany.

EM7.8.03

In Situ Optical Measurement of Single Nanoparticles Using Photo-Thermal and Hyperspectral Imaging Hyun Huh¹, Sung-Jin Chang², Geon Hee Kim¹ and Ki Soo Chang¹; ¹Korea Basic Science Institute, Korea (the Republic of); ²Chung-Ang University, Korea (the Republic of).

EM7.8.04

Formation Mechanism of Magnetic-Plasmonic Ag@FeCo@Ag Core@Shell@Shell Nanoparticles—Fact is More Interesting Than Fiction Mari Takahashi, Koichi Higashimine, Priyank Mohan, Derrick Mott and Shinya Maenosono; JAIST, Japan.

EM7.8.05

Responsive Plasmonic Behavior of Gold Nanocrystal@Polyaniline Core/Shell Nanostructures Ju-Won Jeon, Jing Zhou, Jeffrey Geldmeier, James Ponder, Mahmoud A. Mahmoud, Mostafa A. El-Sayed, John R. Reynolds and Vladimir Tsukruk; Georgia Institute of Technology, United States.

EM7.8.06

The Effect of Plasmon Resonance Coupling in P3HT-Coated Silver Nanodisk Monolayers on Their Optical Sensitivity Jeffrey Geldmeier, Mahmoud A. Mahmoud, Ju-Won Jeon, Mostafa A. El-Sayed and Vladimir Tsukruk; Georgia Institute of Technology, United States.

EM7.8.07

Effect of Nanoscale Structures on the Optical Properties of DNA-NP Superlattice Lin Sun, Haixin Lin, Daniel J. Park, Jessie Ku, Michael B. Ross, Nicolas Large, George C. Schatz and Chad A. Mirkink; Northwestern University, United States.

EM7.8.08

Kelvin Probe Force Microscopic Images on Gold Nanodisks with and without Light Irradiation Tomotarou Ezaki¹, Akihiro Matsutani², Kunio Nishioka², Dai Shoji², Mina Sato², Takayuki Okamoto³, Toshihiro Isobe¹, Akira Nakajima¹ and Sachiko Matsushita¹; ¹Tokyo Institute of Technology, Japan; ²Tokyo Institute of Technology, Japan; ³RIKEN, Japan.

EM7.8.09

Au@FeCo Core-Shell Plasmonic Nanoparticles with Magnetic Manipulation Capability Ryoichi Kitaura, Mari Takahashi, Priyank Mohan, Derrick M. Mott and Shinya Maenosono; Japan Advanced Institute of Science and Technology (JAIST), Japan.

EM7.8.10

Tunable Peptide Constructs for Systematically Controlling the Structure and Assembly of Chiral Gold Nanoparticle Single Helices Soumitra Mokashi Puneekar, Andrea Merg and Nathaniel Rosi; University of Pittsburgh, United States.

EM7.8.11

Paper-Based Plasmonic Surface for Chemical Biosensing by the Attenuated Total Reflection Method Nobuko Fukuda, Tithimanan Srimongkon, Hirobumi Ushijima and Noritaka Yamamoto; AIST, Japan.

EM7.8.12

Large Area Single Crystal Silver Thin Films for Plasmonics and Metamaterials Takashi Uchino¹, V. A. Fedotov², J. Ou² and Tasuku Koiwa¹; ¹Tohoku Institute of Technology, Japan; ²University of Southampton, United Kingdom.

EM7.8.13

Inverse Opals for Active Colour Tuning Devices Diego Bracho Garcia, Ian Hamerton and Annella Seddon; University of Bristol, United Kingdom.

EM7.8.14

Scalable and Pure Nanoporous Metallic Networks Racheli Ron and Adi Salomon; Bar-Ilan University, Israel.

EM7.8.15

The Chiral Coefficient—Rapid Optimization of Broadband Plasmonic Chirality Jon C. Wilson¹, Sven Herrmann², Phillipp Gutsche², Sven Burger^{2,3} and Kevin M. McPeak¹; ¹Louisiana State University, United States; ²Zuse Institute Berlin, Germany; ³JCMwave GmbH, Germany.

EM7.8.16

Effect of Metal/Dielectric Environments on the Emission Kinetics of HITC Dye Srujana Prayakara, Carl Bonner and Mikhail Noginov; Norfolk State University, United States.

EM7.8.17

Chiral Patterning of Extended Nanometric Structures Produced by Colloidal Lithography Sabine Portal¹, Carles Corbella Roca¹ and Oriol Arteaga²; ¹Ruhr-Universität Bochum, Germany; ²Barcelona University, Spain.

EM7.8.18

Passive and Active Plasmonic Interferometers for Biochemical Sensing Dongfang Li, Jing Feng and Domenico Pacifici; Brown University, United States.

SESSION EM7.9: Functional Plasmonics for Physics,
Chemistry, Biology and Materials Science I
Session Chair: Ralf Jungmann
Thursday Morning, December 1, 2016
Hynes, Level 3, Ballroom A

8:30 AM *EM7.9.01

Actuation of Stimulus-Responsive Plasmonic Nanoparticles David S. Ginger; University of Washington, United States.

9:00 AM EM7.9.02

Single-Molecule Surface-Enhanced Raman Measurements in Individual Hot Spots Nam Hoon Kim¹, Wooseup Hwang², Kangyun Baek¹, Md. R. Rohman¹, Jeehong Kim², Gyeonwon Yun¹, Martin Moskovits⁴ and Kimoon Kim^{1,2,3}; ¹Institute for Basic Science (IBS), Korea (the Republic of); ²Pohang University of Science and Technology, Korea (the Republic of); ³Pohang University of Science and Technology, Korea (the Republic of); ⁴University of California, Santa Barbara, United States.

9:15 AM EM7.9.03

Measuring Viral Membrane Fluidity Based on the Scattered Light Polarization Fluctuations of Plasmonic Nanoparticle Labels Amin Feizpour, Behnaz Eshaghi, Hisashi Akiyama, Suryaram Gummuluru and Bjoern M. Reinhard; Boston University, United States.

9:30 AM *EM7.9.04

Integration of Plasmonic Heating with Phase Transition for Novel Applications Younan Xia; Georgia Institute of Technology, United States.

10:00 AM BREAK

10:30 AM *EM7.9.05

Super-Resolution Microscopy with DNA Molecules Ralf Jungmann¹; ²Ludwig Maximilian University, Germany; ³Max Planck Institute of Biochemistry, Germany.

11:00 AM EM7.9.06

Plasmonic Nanoparticle Networks Assembled from DNA Origami Pengfei Wang^{2,1}, Kai Guo³, Yoonjo Hwang³, Kyungiin Park³, Seungwoo Lee³ and Yonggang Ke^{2,1}; ¹Georgia Institute of Technology, United States; ²Emory University, United States; ³Sungkyunkwan University, Korea (the Republic of).

11:15 AM EM7.9.07

Self-Assembled Plasmonic Nanoparticles for Organic Photovoltaics Francesco Pastorelli; DTU, Denmark.

11:30 AM *EM7.9.08

Reconstructing Hydrogen-Induced Phase Transitions in Individual Nanocrystals Andrea Baldi¹, Tarun C. Narayan², Ai Leen Koh³, Robert Sinclair² and Jennifer A. Dionne^{2,4}; ¹Dutch Institute for Fundamental Energy Research (DIFFER), Netherlands; ²Stanford University, United States; ³Stanford University, United States; ⁴SLAC National Accelerator Laboratory, United States.

SESSION EM7.10: Functional Plasmonics for Physics,
Chemistry, Biology and Materials Science II
Session Chair: Maximilian Urban
Thursday Afternoon, December 1, 2016
Hynes, Level 3, Ballroom A

1:30 PM *EM7.10.01

Colloidal Nanocrystals Absorbing in the NIR—Synthesis, Transformations and Applications Liberato Manna; Inst Italiano di Tecnologia, Italy.

2:00 PM EM7.10.02

Preferential Methane Production from Photocatalytic Carbon Dioxide Hydrogenation on Plasmonic Rhodium Photocatalysts Xiao Zhang, Henry Everitt and Jie Liu; Duke University, United States.

2:15 PM *EM7.10.03

Programmable DNA Origami for Plasmonic Molecules, 2D Clusters and 2D Lattices Pengfei Wang¹, Stavros Gaitanaros², Seungwoo Lee³, Mark Bathe², William Shih^{4,5,6} and Yonggang Ke¹; ¹Georgia Institute of Technology and Emory University, United States; ²Massachusetts Institute of Technology, United States; ³Sungkyunkwan University, Korea (the Republic of); ⁴Harvard University, United States; ⁵Harvard Medical School, Harvard University, United States; ⁶Harvard Medical School, Harvard University, United States.

2:45 PM EM7.10.04

Self-Assembly for Active Plasmonic Devices Farnaz Nirouei, Mayuran Saravanapavanantham, Timothy M. Swager, Jeffrey Lang and Vladimir Bulovic; Massachusetts Institute of Technology, United States.

3:00 PM BREAK

3:30 PM *EM7.10.05

Tuning Localized Surface Plasmon Resonance in Metal Oxide Nanocrystals Delia Milliron; The University of Texas at Austin, United States.

4:00 PM *EM7.10.06

3D DNA Plasmonics Maximilian J. Urban¹ and Na Liu^{1,2}; ¹Max Planck Institute for Intelligent Systems, Germany; ²University of Heidelberg, Germany.

4:30 PM EM7.10.07

Plasmonic Nanopores for Single Molecule Sensing Francesca Nicoli², Daniel Verschuere², Maxim Belkin³, Aleksei Aksimentiev³, Cees Dekker² and Magnus P. Jonsson^{1,2}; ¹Linköping University, Sweden; ²Delft University of Technology, Netherlands; ³University of Illinois at Urbana-Champaign, United States.

SESSION EM7.11: Poster Session III: Functional Plasmonics
Thursday Afternoon, December 1, 2016
8:00 PM - 10:00 PM
Hynes, Level 1, Hall B

EM7.11.01

Effects of Metal Film Thickness and Gain on the Coupling of Organic Semiconductor Emission to Surface Plasmon Polaritons Ankur Dalsania¹, Jesse Kohl², Cindy Kumah³, Zeqing Shen¹, Christopher Petoukhoff², Catrice Carter² and Deirdre O'Carroll^{1,2,4}; ¹Rutgers University, United States; ²Rutgers University, United States; ³University of Maryland, United States; ⁴Rutgers University, United States.

EM7.11.02

Broadband Light Absorption in Ultrathin Planar Metallic Films Artur Davoyan^{2,3,1}, Giulia Tagliabue^{4,1} and Harry A. Atwater^{2,3,1}; ¹California Institute of Technology, United States; ²Resnick Sustainability Institute, United States; ³Kavli Nanoscience Institute, United States; ⁴Joint Center for Artificial Photosynthesis, United States.

EM7.11.03

Scanning-Free Near Field Optical Microscopy with Tunable Plasmonic Graphene Gratings Sandeep Inampudi, Jierong Cheng and Hossein Mosallaei; Northeastern University, United States.

EM7.11.04

Optoelectronic Properties of Polymer Semiconductor Films Integrated with Plasmon-Upconversion Coupling Yu Jin Jang¹, Eunah Kim¹, Sunghyun Ahn², Kyungwha Chung¹, Jihyeon Kim¹, Heejun Kim¹, Huan Wang¹, Yoon Hee Jang^{1,3}, Jiseok Lee², Dong-Wook Kim¹ and Dong Ha Kim¹; ¹EWHA Womans University, Korea (the Republic of); ²Ulsan National Institute of Science and Technology (UNIST), Korea (the Republic of); ³Korea Institute of Science and Technology (KIST), Korea (the Republic of).

EM7.11.05

Symmetry Breaking, Facet Stability and Shape Control in Au Nanorod Growth Joanne Etheridge, Wenming Tong, Michael Walsh, Hadas Katz-Boon and Alison Funston; Monash Univ, Australia.

EM7.11.06

Plasmonic Induced Local Temperature Rise Measured by Upconversion Nanothermometry for Hyperthermia Mengistie L. Debasu^{1,2}, Carlos D. Brites¹, Sangeetha Balabhadra¹, Helena Oliveira³, Joao Rocha² and Luis D. Carlos¹; ¹University of Aveiro, Portugal; ²University of Aveiro, Portugal; ³University of Aveiro, Portugal.

EM7.11.07

Gold Nanostars with Tunable Plasmonic Properties for Identification, Localization, and Quantification of Biologically-Relevant Targets Ted Tsoulos, Supriya Atta, Manjari Bhamidipati and Laura Fabris; Rutgers University, United States.

EM7.11.08

Probing Charge Transfer Plasmons in Metallic Koch-Type Antennas across the Terahertz Domain Arash Ahmadvand, Raju Sinha, Mustafa Karabiyik, Phani Kiran Vabbina, Burak Gerislioglu and Nezih Pala; Florida International University, United States.

EM7.11.09

Formation of Metal Nanowire Array by Mechanical Deformation Using Anodic Porous Alumina Molds and Its Application To Plasmonic Devices Toshiaki Kondo, Takashi Yanagishita and Hideki Masuda; Tokyo Metropolitan University, Japan.

EM7.11.10

High Responsivity Infrared Graphene-Based Photodetector Assisted by Plasmonic Effect Chen Zefeng; CUHK, China.

EM7.11.11

Fabrication of Wafer-Scale Uniform Surface Enhanced Raman Scattering (SERS) Substrates for Quantitative Bio Sensing Daejong Yang, Hyunjun Cho, Madelyn I. Wang, Kelly Woo, Sagar R. Vaidyanathan and Hyuck Choo; California Institute of Technology, United States.

EM7.11.12

From Weak to Ultrastrong Light-Matter Coupling in (6,5) Carbon Nanotubes and Plasmonic Crystals Yuriy Zakharko, Arko Graf and Jana Zaumseil; University of Heidelberg, Germany.

EM7.11.13

Silver Plasmonic Nanofluids for Solution Processed Solar Cells Spyridon Kassaveti^{1,2}, Christos Kapnopoulos¹, Panos Patsalas¹, Elefterios Lidorikis² and Stergios Logothetidis¹; ¹Aristotle University of Thessaloniki, Greece; ²University of Ioannina, Greece.

EM7.11.14

Focusing of THz Waves Using Silicon-Based Hyperbolic Metamaterials Akash Kannegulla and Li-Jing Cheng; Oregon State University, United States.

EM7.11.15

Surface Plasmon Enhanced Molecular Beacons for Sensitive DNA Detection Akash Kannegulla, Ye Liu and Li-Jing Cheng; Oregon State University, United States.

EM7.11.16

A Plasmonic Platform with Disordered Array of Metal Nanoparticles for Three-Order Enhanced Upconversion Luminescence and Highly-Sensitive Near-Infrared Photodetector Seok Joon Kwon, Gi Yong Lee, Kinam Jung, Hyungduk Ko, Ho Seong Jang and Il Ki Han; Korea Institute of Science and Technology, Korea (the Republic of).

EM7.11.17

Microparticle Manipulation Using Thermoplasmonic Marangoni Flow Kyoko Namura, Kaoru Nakajima and Motofumi Suzuki; Kyoto University, Japan.

EM7.11.18

Sensing Performance of Hybrid Magnetoplasmonic Nanohole Arrays Antonio Garcia-Martin¹, Blanca Caballero¹ and Juan Carlos Cuevas²; ¹CSIC, Spain; ²Universidad Autonoma de Madrid, Spain.

EM7.11.19

Designing Shape of Plasmonic Nanoparticle through Organothiol Molecule for Unprecedented Optical Property Hye-Eun Lee, Hyo-Yong Ahn, Yoon Young Lee and Ki Tae Nam; Seoul National University, Korea (the Republic of).

EM7.11.20

Plasmonic Activation of Platinum Clusters for Photocatalysis Sarah Wieghold¹, Lea Nienhaus², Fabian Knoller¹, Florian Schweinberger¹, Joseph W. Lyding³, Ueli Heiz¹, Martin Gruebele³ and Friedrich Esch¹; ¹Technische Universität München, Germany; ²Massachusetts Institute of Technology, United States; ³University of Illinois, United States.

EM7.11.21

Isolating the Plasmonic Properties of Non-Noble Copper Nanoparticles through Heterostructuring Derrick Mott and Shinya Maenosono; JAIST, Japan.

EM7.11.22

Computational Study of Molecular Plasmons in Few-Nanometer Sized Graphene Nanoflakes David Z. Manrique and Nicolae C. Panoiu; University College London, United Kingdom.

EM7.11.23

Hybrid Plasmonic Cavity Design for THz Generation Qiang Liu^{1,2}, Sacharia Albin³, Zhengbiao Ouyang^{1,2} and Suling Shen⁴; ¹College of Electronic Science and Technology of Shenzhen University, China; ²THz Technical Research Center of Shenzhen University, China; ³Engineering Department, Norfolk State University, United States; ⁴Department of Electronic Engineering, The Chinese University of Hong Kong, Hong Kong.

EM7.11.24

Plasmon-Enhanced Whispering Gallery Mode Emission from Metal-Dielectric Core-Shell Resonator Trong H. Ngo^{1,2,3}, Ching-Hang Chien^{1,2,3}, Yu-Da Chen^{1,2,3} and Yia-Chung Chang^{1,4}; ¹Academia Sinica, Taiwan; ²Academia Sinica, Taiwan; ³Academia Sinica, Taiwan; ⁴National Cheng Kung University, Taiwan.

EM7.11.25

Tunable Plasmonic Metamaterials through Geometric Tuning Jeremy Reeves, Thomas Stark, Lawrence Barrett, Richard Lally and David Bishop; Boston University, United States.

EM7.11.26

Synthesis of Plasmonics Saturn-Like Particles Mai S. Desouky, Hanbin Zheng and Serge Ravaine; University of Bordeaux, France.

EM7.11.27

Directed-Assembled Moiré Plasmonic Metasurfaces for Multi-Functional Biomedical Application Zilong Wu and Yuebing Zheng; University of Texas at Austin, United States.

EM7.11.28

Deep-UV Plasmonics Based on Metal Nanoparticles and Resonant Mode Coupling Koichi Okamoto¹, Haruku Nishida¹, Daisuke Tanaka², Kouta Okura¹, Kazutaka Tateishi¹, Sou Ryuzaki¹, Pangpang Wang¹ and Kaoru Tamada¹; ¹Kyushu University, Japan; ²NIT Oita College, Japan.

EM7.11.29

Localized Surface Plasmon Resonances in Fully-Encapsulated Aluminium NanoVoids Ye Zhu¹, Philip Nakashima¹, Alison Funston², Laure Bourgeois¹ and Joanne Etheridge^{1,3}; ¹Monash University, Australia; ²Monash University, Australia; ³Monash University, Australia.

EM7.11.30

Selective Excitation of Individual Multipolar Resonances in Single Core (Dielectric)-Satellite (Metal) Structures Tian-Song Deng¹, U. Manna², J.H. Lee¹, J. Parker^{2,3}, N. Shepherd^{1,2}, Y. Weizmann¹ and N. F. Scherer^{1,2}; ¹University of Chicago, United States; ²University of Chicago, United States; ³University of Chicago, United States.

EM7.11.31

CMOS-Compatible Zero-Index Metamaterial Yang Li, Daryl Vulis, Orad Reshef, Philip Camayd-Munoz, Mei Yin, Shota Kita, Marko Loncar and Eric Mazur; Harvard University, United States.

EM7.11.32

Fabrication of Plasmonic Biomimic Substrates Anatoliy Pinchuk; University of Colorado at Colorado Springs, United States.

EM7.11.33

Angle-Dependant Broadband Reflectance of Direct Laser Fabricated Plasmonic Nanoparticle Templates on Silica of Varying Thickness Jacob L. Spear¹, Dimitris Bellas², D. J. Fairhurst¹, Nikolaos Kalfagiannis¹, Elefterios Lidorikis² and D. C. Koutsogeorgis¹; ¹Nottingham Trent University, United Kingdom; ²University of Ioannina, Greece.

EM7.11.34

Engineered Core-Shell Nanostructures for Plasmon Enhanced Difference Frequency Generation in Terahertz Range Raju Sinha, Arash Ahmadvand, Phani Kiran Vabbina, Mustafa Karabiyik, Burak Gerislioglu and Nezh Pala; FIU, United States.

SESSION EM7.12: Infrared Spectroscopy and Chiral Plasmonics

Session Chair: Mark Andrews

Friday Morning, December 2, 2016

Sheraton, 2nd Floor, Back Bay D

8:00 AM *EM7.12.01

Resonant Plasmonic Nanoantennas for Mid-Infrared Spectroscopy and Sensing Frank Neubrech; University of Stuttgart, Germany.

8:30 AM EM7.12.02

Near-Infrared Plasmon - Plasmon and Plasmon - Vibration Coupling with Faceted Metal Oxide Nanocrystals Ajay Singh^{1,2}, Ankit Agrawal² and Delia Milliron²; ¹Los Alamos National Lab, United States; ²University of Texas at Austin, United States.

8:45 AM EM7.12.03

Pixel-less Spatial Modulation of Thermal Emissivity in Active Infrared Metamaterials Zachary J. Coppens and Jason Valentine; Vanderbilt University, United States.

9:00 AM EM7.12.04

Multispectral Infrared Detection Using Plasmonic Resonant Absorbers Integrated with Room-Temperature VO₂ Air-Bridge Bolometers Robert E. Peale; University of Central Florida, United States.

9:15 AM EM7.12.05

Self-Assembled Core-Shell Clusters as Plasmonic Infrared Resonators Kan Yao and Yongmin Liu; Northeastern University, United States.

9:30 AM EM7.12.06

Gyroid Photonic Crystal with Weyl Points—Synthesis and Mid-Infrared Photonic Characterization Siying Peng¹, Emil T. Khabiboulline¹, Runyu Zhang², Hongjie Chen¹, Philip Hon³, Sisir Yalamanchili¹, Juan Garcia³, Luke A. Sweatlock³, Paul V. Braun² and Harry A. Atwater¹; ¹California Institute of Technology, United States; ²University of Illinois at Urbana-Champaign, United States; ³Northrop Grumman Aerospace Systems, United States.

9:45 AM EM7.12.07

Large Absolute Amplitude, Ultrafast All-Optical Modulation of the Visible and Infrared Spectrum Using Indium Tin Oxide Nanorod Arrays Peijun Guo¹, Richard D. Schaller^{1,2}, Benjamin T. Diroll², Leonidas E. Ocola², John B. Ketterson¹ and Robert P. Chang¹; ¹Northwestern University, United States; ²Argonne National Laboratory, United States.

10:00 AM BREAK**10:30 AM *EM7.12.08**

Towards All-Optical Chiral Resolution with Achiral Plasmonic Nanostructures Yang Zhao¹, Amr A. Saleh¹, Marie-Anne Van der Haar², Albert Polman² and Jennifer A. Dionne¹; ¹Stanford University, United States; ²FOM Institute AOLF, Netherlands.

11:00 AM EM7.12.09

Revealing Near-Field Chirality in the Far Field Lisa V. Poulikakos, Eva De Leo, Boris le Feber, Ferry Prins and David J. Norris; ETH Zürich, Switzerland.

11:15 AM EM7.12.10

Magneto-Optical Activity in High-Index Dielectric Nanoantennas Nuno de Sousa³, Luis Salvador Froufe-Perez², Juan Jose Saenz⁴ and Antonio Garcia-Martin¹; ¹CSIC, Spain; ²University of Fribourg, Switzerland; ³Universidad Autonoma de Madrid, Spain; ⁴Donostia International Physics Center, Spain.

11:30 AM EM7.12.11

Active Nanorheology with Magnetically Switchable Chiral Plasmonics Andrew G. Mark¹, Hyeon-Ho Jeong^{1,2}, Tung-Chun Lee^{1,3}, Mariana Alarcon-Correa^{1,4}, Sahand Eslami^{1,4}, Tian Qiu^{1,5} and John G. Gibbs^{1,6}; ¹Max Planck Institute for Intelligent Systems, Germany; ²École Polytechnique Fédérale de Lausanne, Switzerland; ³University College London, United Kingdom; ⁴University of Stuttgart, Germany; ⁵École Polytechnique Fédérale de Lausanne, Switzerland; ⁶Northern Arizona University, United States.

11:45 AM EM7.12.12

Chiral Plasmonic Nanosensors Hyeon-Ho Jeong^{1,2}, Andrew G. Mark¹ and Peer Fischer^{1,3}; ¹Max Planck Institute for Intelligent Systems, Germany; ²École Polytechnique Fédérale de Lausanne (EPFL), Switzerland; ³University of Stuttgart, Germany.

Report to Army Research Office (ARO)
MRS 2016 Fall Meeting, Boston, MA, November 27 – December 2, 2016
Symposium MB2: Materials under Mechanical Extremes

Leslie Lamberson (Drexel University)
Avinash Dongare (University of Connecticut)
Jaafar El-Awady (Johns Hopkins University)
Irene Beyerlein (University of California, Santa Barbara)

Summary

At the MRS Fall 2016 meeting in Boston, the MB2 Symposium hosted scientists from academia and national laboratories to discuss their current research on characterizing, understanding and predicting materials under mechanical extremes. Specifically, the focus of the MB2 Symposium directly aligned with ARO's Mechanical Behavior of Materials research area in that they both "seek to reveal underlying design principles and exploit emerging force-activated phenomena in a wide range of advanced materials to demonstrated unprecedented mechanical properties and complementary behaviors." Accordingly, the goal of MB2 was to bring together researchers leading the efforts in the theory, computations, synthesis, and experimental investigations to discuss the current state of materials under mechanical extremes, as well as disseminate advancements necessary for accelerated materials design. The MB2 Symposium featured a four-day full event with 100 presentations, including 72 oral presentations, 25 of which were invited speakers from national labs and universities from around the world, and 28 poster presentations. One of our 16 sessions was a joint session with the MB5 Symposium, Size Effects and Small-Scale Mechanical Behavior of Materials, in order to foster collaborations and discussion with cross-cutting topic areas. In addition, three graduate students were presented with certificates and monetary awards for best poster presentations (1st, 2nd and 3rd place, effectively), judged by originality of the research, sound technical content, and presentation of the topic visually and orally to the two of the organizers (who judged the competition). The MB2 the poster prize was created for graduate students to be recognized for their contribution to the meeting, and encourage their future research efforts in this exciting area of research, in order to further the field for years to come.

Objectives

The design of next-generation defense materials and structures relies on the ability to not only predict, but also tailor material behavior under extremes of applied pressure, strain, strain-rates, and shock to resist failure. The response of these materials, particularly relevant on the battlefield, leverages on their ability to distribute load (often at a rapid speed) as they deform plastically via nucleation and propagation of defects, and activate failure mechanisms such as crack nucleation and growth to dissipate incoming energy. The recent advances in theory, modeling, simulation, synthesis, as well as in-situ characterization of microstructural evolution and properties, shed light on the ability to understand, and further *control* the evolution of microstructure during deformation. Symposium MB2 brought together leading researchers that are key in this area of materials development. With 100 presentations, the MB2 Symposium was divided into the following 15 sessions under the umbrella of extreme mechanics of materials:

1. Fracture
2. Defect Evolution
3. Atomic Scale Simulations
4. Microstructural Effects on High Temperature Mechanical Behavior
5. Impact & Shock
6. Continuum/Mesoscale Modeling
7. Atomistic/Mesoscale Modeling of Shock & Impact
8. Mechanics at Small Scales
9. Mechanics of Nanoscale Materials (joint with MB5)
10. Damage Characterization
11. Fatigue & Corrosion
12. Phase Transformations
13. Irradiation Effects
14. Molecular Systems
15. Severe Plastic Deformation/High Pressures

In focus area (1), K.T. Ramesh of Hopkins Extreme Materials Institute kicked off our MB2 Symposium as a keynote, highlighting some of the challenges involved in length and time scale resolution and coupling of complex material deformation under extreme events, followed by invited-speaker David Bahr from Purdue, who continued down in length scales to discuss intrinsic and extrinsic effects in dislocation nucleation in transition metals. The session was completed after two more talks that focused on fracture of boron carbide under high strain rates. In focus area (2), Curt Bronkhorst from Los Alamos National Laboratory

kicked off the session as an invited speaker showing new work on twin formation and growth in titanium, and four more presentations followed that all focused on dislocation nucleation and growth of various metals, both with experimental and computational characterization.

Focus area (3) began with an invited talk by David Rodney from University of Lyon in France on ab initio modeling of dislocation cores in BCC and HCP metals, and then the session followed with atomistic simulation talks of various defect evolutions in metals at high rates. Suveen Mathaudhu of University of California, Riverside, kicked off focus area (4) as an invited speaker discussing thermal stability and mechanical performance of gradient structured aluminum, and then four more talks followed on deformation mechanisms of ultrafine-grained BCC chromium, fine-grained magnesium alloys, and ARB-fabricated Cu/Nb nanoscale multilayers.

Focus areas (5) and (7) were similar in that they both examined material behavior under shocks and impacts. Here invited speakers Christopher Schuh of MIT presented on supersonic impacts of metallic micro-particles, Mark Aindow of University of Connecticut presented on cold spray impact phenomenon of aluminum alloy powders, and Naresh Thadhani of Georgia Tech showed mesoscale simulations of shock wave interactions with heterogeneities in energetic materials.

Focus area (6) kicked off with an invited talk by Wei Cai of Stanford, who presented on dislocation junctions in work hardening of FCC metals, followed by four more presentations on computational investigations of deformations and failure modes under high strain rates. Focus area (8) and (9) examined lower length scale deformation under extremes, with keynotes by Peter Hosemann from Berkley on small scale mechanical testing for nuclear applications, Amit Misra from the University of Michigan presenting on plasticity in small-scale metallic structures at mechanical extremes, and Mara Nathan from Los Alamos National Laboratory on microstructural behavior of HCB/BCC nanolaminate composites. Focus area (10) continued the lower length scale investigations, emphasizing microscopy for damage characterization with talks utilizing x-ray microscopy and phase-contrast imaging of cracks and damage, as well as TEM and ATP.

Focus area (11) explored fatigue under extreme conditions with Tresa Pollock as an invited speaker who presented on strain localization in Ni-based alloys under low and high cycle fatigue; whereas focus area (12) emphasized phase

transformations with an invited talk by Corinne Packard from Colorado School of Mines speaking on Xenotime rare-earth orthophosphate, and Manuel Ramos from University of Texas, El Paso, on MoS₂ thin films. Focus area (13) emphasized mechanics of irradiation effects, including an invited talk from Yuntian Zhu from North Carolina State University on in-situ atomic observations of irradiation-induced void formation and growth, and Emmanuelle Marquis from the University of Michigan on condition and dose effects in irradiated Fe-Cr alloys. Focus area (14) began with an invited talk on reactive nanosystems under thermomechanical extremes by Priya Vashishta of the University of Southern California and continued with four more talks on molecular scale deformations and phase transformations under shock and Taylor anvil and plate impact. The last session of the Symposium, focus area (15), was on severe plastic deformation/high pressures and included an invited talk by Ludovic Thilly from the University of Poitiers, France, on the size and architecture effects of Cu/Nb nanocomposite wires processed by severe plastic deformation for high pulsed magnets. Audience members during the symposium varied from a few tens to a over one hundred, with an average of about 30 to 40 consistent attendees per session.

With 28 posters presented in the poster session, three graduate students were nominated by the symposium organizers to receive awards for their work. These young researchers included: 1st place to Wanting Zie from the University of Massachusetts, Amherst for his work on microballistic experiments of single aluminum particles for cold spray additive manufacturing, 2nd place to Jie Chen of University of Connecticut for his work on the shock response of nanocrystalline Cu-Ta systems at the atomic scale, and 3rd place to Xiaoyu Ji from Penn State University for his work presented on silicon microwire under negative pressure.

In terms of funding management, the MB2 Symposium organizers used the ARO grant to provide an honorarium to all 25 of the invited speakers to help mitigate travel costs, who were carefully selected based on the following 3 criteria: (1) individual contributions to the field of extreme material mechanics, (2) reputation in the community in regards to scholarship of the scientist, and (3) potential of the work to help make significant gains in either synthesizing, tailoring, characterizing, and/or predicting material behavior in or for extreme condition applications. In addition, the organizers and invited speakers had dinner together one night of MRS to create a community gathering to discuss the importance of the

field, establish dialogue between relevant focus areas and researchers, and strengthen potential visibility, collaborations, with the plan of eventual research gains in the field of materials under mechanical extremes. Lastly, small monetary awards were made to each of the three graduate student poster winners, in effort to encourage the next generation of extreme material mechanics.

Future Directions

Materials are paramount to the technologies required for future defense needs, and increasing demands on performance in a range of extremes is required. As such, the extreme behavior of materials may be subjugated to balance the mechanical and thermal energies, and manipulate the dichotomy that governs the physical (and potentially further chemical) phenomena, but requires careful, relevant and collaborative investigations. Advancements in this field and collaborations are only possible due to conferences, or more broadly the dissemination and discussion of its leading scientists, which was the goal of the MB2: Materials under Mechanical Extremes; and we hope to continue in future conference symposium under this theme. As a result of these continued efforts, evolution of materials and the advancement of next-generation materials in or for mechanical extremes may be more rapidly elucidated.

Acknowledgements

The organizers of MB2 would like to gratefully acknowledge the support from the Army Research Office, which was critical to the success of the symposium. In addition, the organizers are incredibly appreciative of the helpful support from all of the MRS staff, and notably Mr. Gopinath Kalavar, for his personal assistance in our symposium.

SYMPOSIUM MB2

Materials under Mechanical Extremes
November 28 - December 1, 2016

Symposium Organizers

Irene Beyerlein, Los Alamos National Laboratory
Avinash Dongare, University of Connecticut
Jaafar El-Awady, Johns Hopkins University
Leslie Lamberson, Drexel University

All journals in the MRS portfolio welcome submissions based on the individual presentations at the 2016 MRS Fall Meeting. Papers submitted and accepted for publication in MRS Advances (www.mrs.org/mrs-advances) will be available as collections of the symposia. Visit the MRS/Cambridge University Press Publications Booth #100 in the Exhibit Hall to learn more about MRS Advances, including print options available at special rates during the meeting week only.

* Invited Paper

SESSION MB2.1: Fracture

Session Chairs: Irene Beyerlein and Leslie Lamberson
Monday Morning, November 28, 2016
Sheraton, 2nd Floor, Constitution A

8:30 AM *MB2.1.01

Materials under Extreme Conditions Kaliat T. Ramesh; Johns Hopkins University, United States.

9:00 AM *MB2.1.02

Intrinsic and Extrinsic Effects of Defects on Size Effects and Dislocation Nucleation in Transition Metals David F. Bahr¹ and Michael R. Maughan²; ¹Purdue University, United States; ²University of Idaho, United States.

9:30 AM *MB2.1.03

Compression Strength of Boron Carbide at Quasi-Static and Dynamic Rates Jeffrey J. Swab¹, Christopher S. Meredith¹, Robert Gamble², Daniel T. Casem¹, Eric Warner², John Pittari III³ and Matthew Bratcher¹; ¹U.S. Army Research Laboratory, United States; ²Bowhead Science and Technology, United States; ³Oak Ridge Institute for Science and Education, United States.

10:00 AM BREAK

SESSION MB2.2: Defect Evolution

Session Chairs: Irene Beyerlein and Curt Bronkhorst
Monday Morning, November 28, 2016
Sheraton, 2nd Floor, Constitution A

10:30 AM *MB2.2.01

A Study of Twin Formation and Early Stage Growth in High-Purity Titanium Curt A. Bronkhorst, Hashem Mourad, Veronica Livescu and Irene J. Beyerlein; Los Alamos National Laboratory, United States.

11:00 AM MB2.2.02

In Situ TEM Characterization of Metallic Samples Deforming at Low and High Strain Rates Thomas Voisin¹, Michael D. Grapes¹, Yong Zhang¹, Nicholas J. Lorenzo², Jonathan P. Ligda², Brian Schuster², Tian Li³, Melissa K. Santala³, Geoffrey H. Campbell³ and Timothy P. Weihs¹; ¹Johns Hopkins University, United States; ²Army Research Laboratory, United States; ³Lawrence Livermore National Laboratory, United States.

11:15 AM MB2.2.03

Dislocation Nucleation Controlled Deformation in Angstrom Scaled FCC Twins Scott X. Mao¹, Jiangwei Wang¹ and Frederic Sansoz²; ¹University of Pittsburgh, United States; ²University of Vermont, United States.

11:30 AM MB2.2.04

Dislocation Evolution and Mode Transitions in Tantalum Compressed under Extreme Pressure Conditions Luke L. Hsiung and Ricky Chau; Lawrence Livermore National Laboratory, United States.

11:45 AM MB2.2.05

Lattice Instability of Advanced Alloys and Its Effects on Deformation Defect Nucleation Liang Qi; University of Michigan, United States.

SESSION MB2.3: Atomic Scale Simulations

Session Chairs: Avinash Dongare and Jaafar El-Awady
Monday Afternoon, November 28, 2016
Sheraton, 2nd Floor, Constitution A

1:30 PM *MB2.3.01

Ab Initio Modeling of Dislocation Cores in BCC and HCP Metals David Rodney¹, Lucile Dezerald², Emmanuel Clouet³, Lisa Ventelon³ and Francois Willaime³; ¹University of Lyon, France; ²University of Lorraine, France; ³CEA Saclay, France.

2:00 PM MB2.3.02

Atomic Scale Modeling of the Deformation and Failure Behavior of HCP Metals at High Strain Rates Garvit Agarwal and Avinash M. Dongare; University of Connecticut, United States.

2:15 PM MB2.3.03

Atomistic Simulations Study of Diffusion at Dislocations Frederic Houle¹, Jutta Rogal², Thomas Schablitzki², Ralf Drautz² and Erik Bitzek¹; ¹Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany; ²Ruhr-Universität Bochum, Germany.

2:30 PM MB2.3.04

Anisotropy of Solute Effect on Dislocation Slip in an HCP Metal—An Atomistic Simulation Study of Mg Alloys Peng Yi and Michael L. Falk; Johns Hopkins University, United States.

2:45 PM MB2.3.05

Atomic-Scale Modeling of Point Defects, Phase Stability, and the Formation Mechanism of Z Phases CrMN (M=V, Nb, Ta) Daniel F. Urban¹ and Christian Elsaesser^{1,2}; ¹Fraunhofer IWM, Germany; ²University of Freiburg, Germany.

3:00 PM BREAK

SESSION MB2.4: Microstructure Effects on High Temp Mechanical Behavior

Session Chairs: Mark Aindow and Christopher Meredith
Monday Afternoon, November 28, 2016
Sheraton, 2nd Floor, Constitution A

3:30 PM *MB2.4.01

Mechanical Performance and Thermal Stability of Gradient Structured Aluminum Alloys Sina Shahrezadei¹, Jordan Moering³, Yuntian T. Zhu³ and Suveen N. Mathaudhu^{1,2}; ¹University of California, Riverside, United States; ²Pacific Northwest National Laboratory, United States; ³North Carolina State University, United States.

4:00 PM MB2.4.02

Contribution of Free Surface and Dislocation Density to the Strength Scaling Behaviour in Ultrafine-Grained BCC Chromium Reinhard Fritz¹, Alexander Leitner¹, Verena Maier-Kiener² and Daniel Kiener¹; ¹Montanuniversität Leoben, Austria; ²Montanuniversität Leoben, Austria.

4:15 PM MB2.4.03

Deformation Mechanisms and Thermo-Mechanical Behavior of Fine-Grained Magnesium Alloy AMX602 Christopher S. Meredith and Jeffrey T. Lloyd; US Army Research Laboratory, United States.

4:30 PM *MB2.4.04

Optimum Layer Thickness for High Temperature Mechanical Properties of ARB Cu/Nb Nanoscale Multilayers Jeromy Snel², Miguel Monclus², Nathan Mara³, Irene Beyerlein³, Jon Molina-Aldareguia² and Javier Llorca¹; ¹IMDEA Materials Institute and Technical University of Madrid, Spain; ²IMDEA Materials Institute, Spain; ³Los Alamos National Laboratory, United States.

SESSION MB2.5: Poster Session
Session Chairs: Jaafar El-Awady and Leslie Lamberson
Monday Afternoon, November 28, 2016
8:00 PM - 10:00 PM
Hynes, Level 1, Hall B

MB2.5.01

Designing Next Generation Helmets—Linking Failure to Performance Kirsti Ann Bell¹, Pouyan Motamedji^{1,2} and James D. Hogan¹; ¹University of Alberta, Canada; ² National Institute for Nanotechnology, Canada.

MB2.5.02

Creep Response of a Microstructurally Stable Alloy—A Theoretical and Experimental Study Mansa Rajagopalan², K. Darling¹, M. Komarasamy³, M. Bhatia², B. Hornbuckle¹, R. S. Mishra³ and K. N. Solanki²; ¹Army Research Laboratory, United States; ²Arizona State University, United States; ³University of North Texas, United States.

MB2.5.03

Strengthening Mechanism of Lightweight Steel Based Composites by Isothermal Melt Infiltration Ilguk Jo, Seungchan Cho, Sang-Bok Lee and Sang-Kwan Lee; Korean Institute of Materials Science, Korea (the Republic of).

MB2.5.04

Effect of Strain Rate, Heating Rate and Heating Methodology on the Mechanical and Microstructural Properties of Ti-6Al-4V Alloy Amal Shaji Karapuzha^{1,2}, Vicki Wilkes², Darren Wilkes², Jeffery William Brooks³, Bradley P. Wynne¹ and Eric J. Palmiere¹; ¹University of Sheffield, United Kingdom; ²Phoenix Calibration and Services Ltd, United Kingdom; ³University of Birmingham, United Kingdom.

MB2.5.05

Driving Surface Chemistry at the Nanometer Scale Using Localized Heat and Stress Shivaranjan Raghuraman and Jonathan Felts; Texas A&M University, United States.

MB2.5.06

Micro-Ballistic Experiment of Single Aluminum Particles for Cold Spray Additive Manufacturing Wanting Xie^{1,6}, Arash A. Dehkharghani², Xuemei Wang³, Aaron Nardi³, Steven E. Kooi⁴, Victor K. Champagne⁵, Sinan Muftu² and Jae-Hwang Lee¹; ¹University of Massachusetts, United States; ²Northeastern University, United States; ³United Technologies Research Center, United States; ⁴Massachusetts Institute of Technology, United States; ⁵Army Research Laboratory, United States; ⁶University of Massachusetts, United States.

MB2.5.07

Silicon Microwire under Negative Pressure XiaoYu Ji¹, Shiming Lei¹, Hui Yan Cheng¹, Nicolas Poilvert¹, Wenjun Liu², Ismaila Dabo¹, John V. Badding¹ and Venkatraman Gopalan¹; ¹The Pennsylvania State University, United States; ²Argonne National Laboratory, United States.

MB2.5.08

High Impact Shock Tolerant Electronics Sabyasachi Ganguli¹, Chenggang Chen^{2,1}, Ajit K. Roy¹, Amanda Schrand¹ and Jason Foley¹; ¹Air Force Research Laboratories, United States; ²University of Dayton Research Institute, United States.

MB2.5.09

Local-Energy and Local-Stress Analysis of First-Principles Tensile Tests of Grain Boundaries in Al and Cu Hao Wang^{1,2}, Masanori Kohyama¹, Shingo Tanaka¹ and Yoshinori Shiihara³; ¹National Institute of Advanced Industrial Science and Technology, Japan; ²Shanghai University, China; ³University of Tokyo, Japan.

MB2.5.10

Microstructural Development During Particle/Substrate Impacts in Cold Spray of Gas Atomized Aluminum Alloy Powders Benjamin Bedard¹, Tyler Flanagan¹, Sumit Suresh¹, Avinash M. Dongare¹, Seok-Woo Lee¹, Harold D. Body¹, Xuemei Wang², Victor K. Champagne³ and Mark Aindow¹; ¹University of Connecticut, United States; ²United Technologies Research Center, United States; ³US Army Research Laboratory, United States.

MB2.5.11

Mechanical Characterization of Cold Sprayed Aluminum Alloy Powders Using In Situ Micropillar Compression Tyler J. Flanagan¹, Benjamin Bedard¹, Sumit Suresh¹, Mark Aindow¹, Avinash M. Dongare¹, Harold Brody¹, Victor K. Champagne², Xuemei Wang³ and Seok-Woo Lee¹; ¹University of Connecticut, United States; ²U.S. Army Research Laboratory, United States; ³United Technologies Research Center, United States.

MB2.5.12

Atomistically Informed Kinetic Monte Carlo Simulation of Dislocation Motion in Solid Solution Strengthened bcc Alloys Shuhei Shinzato¹, Masato Wakeda¹ and Shigenobu Ogata^{1,2}; ¹Osaka University, Japan; ²Kyoto University, Japan.

MB2.5.13

Role of Platinum in Aluminide Bond Coating—An In Situ Study of Mechanical Properties at Elevated Temperature Sanjit Bhowmick, Douglas D. Stauffer and Syed Asif; Hysitron Inc, United States.

MB2.5.14

Mesoscale Modeling of Single Particle Impact Induced Microstructural Evolution during Cold Spray of Aluminum Powders Sumit A. Suresh¹, Benjamin Bedard¹, Tyler J. Flanagan¹, Seok-Woo Lee¹, Mark Aindow¹, Harold Brody¹, Xuemei Wang², Victor K. Champagne³ and Avinash M. Dongare¹; ¹University of Connecticut, United States; ²United Technologies Research Center, United States; ³U.S. Army Research Laboratory, Weapons and Materials Research Directorate, Aberdeen Proving Ground, United States.

MB2.5.15

Engineering Toughness-Strength Correlation in Glass Tengyuan Hao and Zubaer Hossain; University of Delaware, United States.

MB2.5.16

In Situ Raman Indentation—A New Approach to Study Indentation Induced Structural Changes in Monocrystalline Silicon Praveena Manimunda¹, M.S Bobji² and Syed Asif¹; ¹Hysitron Incorporated, United States; ²Indian Institute of science, India.

MB2.5.17

Crumpling-Induced Toughening in Graphene Fanchao Meng and Jun Song; McGill University, Canada.

MB2.5.18

Dynamic Characterization of POSS-Epoxy Nanocomposite Kunal Mishra and Raman P. Singh; Oklahoma State University, United States.

MB2.5.19

Modelling of Self-Healing Creep Steels Casper Versteyleen, Niels van Dijk and Marcel H. Sluiter; Technische Universiteit Delft, Netherlands.

MB2.5.20

Failure of Granular Boron Carbide under Extreme Loading Matthew Serge², Michael Homel³, Jason Loiseau⁴, Timothy Walter⁵, Pouyan Motamedji¹, Calvin Lo², Eric Herbold³, Andrew Higgins⁴, Tomoko Sano⁵ and James D. Hogan²; ¹National Research Council, Canada; ²University of Alberta, Canada; ³Lawrence Livermore National Laboratory, United States; ⁴McGill University, Canada; ⁵Army Research Laboratory, United States.

MB2.5.21

Shock Response of Nanocrystalline Cu-Ta Systems at the Atomic Scale Jie Chen¹, Mark Tschopp² and Avinash M. Dongare¹; ¹University of Connecticut, United States; ²US Army Research Laboratory, United States.

SESSION MB2.6: Impact/Shock
Session Chairs: Irene Beyerlein and Donald Brenner
Tuesday Morning, November 29, 2016
Sheraton, 2nd Floor, Constitution A

8:30 AM *MB2.6.01

Studies of Supersonic Impact with Individual Metallic Micro-Particles Mostafa Hassani-Gangaraj¹, David Veyssset^{2,3}, Keith A. Nelson^{2,3} and Christopher Schuh¹; ¹Massachusetts Institute of Technology, United States; ²Massachusetts Institute of Technology, United States; ³Massachusetts Institute of Technology, United States.

9:00 AM MB2.6.02

Prediction of Extreme Dynamic Behaviors of Aluminum Microspheres in Supersonic Consolidation Wanting Xie^{1,6}, Arash A. Dehkharghani², Xuemei Wang⁴, Aaron Nardi⁴, Steven E. Kooi³, Victor K. Champagne⁵, Sinan Muftu² and Jae-Hwang Lee¹; ¹University of Massachusetts, United States; ²Northeastern University, United States; ³Massachusetts Institute of Technology, United States; ⁴United Technologies Research Center, United States; ⁵Army Research Laboratory, United States; ⁶University of Massachusetts, United States.

9:15 AM *MB2.6.03

Particle Impact Phenomena in Cold Spray of Gas Atomized Aluminum Alloy Powders Mark Aindow¹, Benjamin Bedard¹, Harold D. Body¹, Victor K. Champagne², Avinash M. Dongare¹, Tyler Flanagan¹, Seok-Woo Lee¹, Sumit Suresh¹ and Xuemei Wang³; ¹University of Connecticut, United States; ²US Army Research Laboratory, United States; ³United Technologies Research Center, United States.

9:45 AM MB2.6.04

Engineering Nano/Microstructure of Metals via High-Velocity Impact Ramathasan Thevamaran¹, Olawale Lawal¹, Sadegh Yazdi¹, Seog-Jin Jeon² and Edwin L. Thomas¹; ¹Rice University, United States; ²University of Massachusetts, United States.

10:00 AM BREAK

SESSION MB2.7: High Temperature Mechanical Behavior

Session Chairs: Jaafar El-Awady and Seok-Woo Lee

Tuesday Morning, November 29, 2016

Sheraton, 2nd Floor, Constitution A

10:30 AM *MB2.7.01

Recent Advances in Nanomechanical Testing—Variable Temperature, Ultra-High Strain Rates, In Situ EBSD Experiments Johann Michler; Empa, Materials Science and Technology, Switzerland.

11:00 AM MB2.7.02

Temperature Triggered Stress-Driven Plasticity and Hardening in Nanotwinned Materials Seyedeih Mohadeseh Taheri Mousavi, Haofei Zhou, Guijin Zou and Huajian Gao; Brown University, United States.

11:15 AM *MB2.7.03

Science of High Entropy Materials for Ultra-High Temperature Application Donald Brenner¹, Stefano Curtarolo², Patrick E. Hopkins³, Elizabeth J. Opila³, Kenneth Vecchio⁴ and Jian Luo⁴; ¹North Carolina State University, United States; ²Duke University, United States; ³University of Virginia, United States; ⁴University of California, San Diego, United States.

11:45 AM MB2.7.04

The Effect of High Pressure and Temperature Conditions on the Microstructure and Mechanical Properties of Polycrystalline Y₂O₃ Jafar AlSharab¹, Stephen Tse² and Bernard Kear²; ¹Northwestern State University, United States; ²Rutgers University, United States.

SESSION MB2.8: Continuum/Mesoscale Modeling

Session Chairs: Wei Cai and Steven Van Petegem

Tuesday Afternoon, November 29, 2016

Sheraton, 2nd Floor, Constitution A

1:30 PM *MB2.8.01

The Role of Dislocation Junctions in the Work Hardening Face-Centered Cubic Metals Wei Cai¹ and Rayn B. Sills²; ¹Stanford University, United States; ²Sandia National Laboratories, United States.

2:00 PM MB2.8.02

Dislocation Self-Organization under Monotonic and Cyclic Loading of Crystals—A Continuum Dislocation Dynamics Approach Shengxu Xia and Anter El-Azab; Purdue University, United States.

2:15 PM MB2.8.03

Microstructural Predictions of Dynamic Thermo-Mechanical Intergranular and Transgranular Fracture Modes in H.C.P. Alloys Mohammed A. Zikry, Shoaib Ziaei and I. Mohamed; North Carolina State University, United States.

2:30 PM MB2.8.04

Atomistically Based Discrete Dislocation Dynamics Simulations on the Effects of Temperature on the c-Axis Deformation of Magnesium Single Crystals Kinshuk Srivastava and Jaafar A. El-Awady; Johns Hopkins University, United States.

2:45 PM MB2.8.05

Lattice Strain Evolution during Biaxial Loading of 316L Stainless Steel Using an FE-FFT Approach Steven Van Petegem¹, Manas V. Upadhyay¹, Tobias Panzner¹, Ricardo Lebensohn² and Helena Van Swygenhoven-Moens^{1,3}; ¹Paul Scherrer Institute, Switzerland; ²Los Alamos National Laboratory, United States; ³École Polytechnique Fédérale de Lausanne, Switzerland.

3:00 PM BREAK

SESSION MB2.9: Atomistic/Mesoscale Modeling of Shock Impact

Session Chairs: Avinash Dongare and Aurelien Vattre

Tuesday Afternoon, November 29, 2016

Sheraton, 2nd Floor, Constitution A

3:30 PM *MB2.9.01

Meso-Scale Simulations and In Situ Characterization of Effects of Shock-Wave Interactions with Heterogeneities in Structural Energetic/Reactive Materials Naresh N. Thadhani; Georgia Institute of Technology, United States.

4:00 PM MB2.9.02

A Molecular Dynamics Study of Martensitic Transformations during Shock of Single Crystal Cu Mehrdad Mirzaei Sichani¹ and Douglas E. Spearot²; ¹University of Arkansas, United States; ²University of Florida, United States.

4:15 PM *MB2.9.03

A Displasive Phase-Field Model to Shock-Induced Martensitic Transitions in Iron Aurelien Vattre and Christophe Denoual; Commissariat à l'Energie Atomique, France.

4:45 PM MB2.9.04

Molecular Dynamics Simulations and Scaling Law of Ballistic Penetration of Graphene Sheets Rafael A. Bizao^{1,2}, Leonardo D. Machado^{1,3}, Jose M. de Sousa^{1,4}, Nicola Maria Pugno^{2,5,6} and Douglas S. Galvao¹; ¹Universidade Estadual de Campinas, Brazil; ²University of Trento, Italy; ³Universidade Federal do Rio Grande do Norte, Brazil; ⁴Universidade Federal do Piauí, Brazil; ⁵Fondazione Bruno Kessler, Italy; ⁶Queen Mary University of London, United Kingdom.

SESSION MB2.10: Molecular Systems

Session Chairs: Ram Devanathan and Avinash Dongare

Wednesday Morning, November 30, 2016

Sheraton, 2nd Floor, Constitution A

8:30 AM *MB2.10.01

Reactive Nanosystems under Thermomechanical Extremes Priya Vashishta¹, Fuyuki Shimojo^{2,1}, Masaaki Misawa^{2,1}, Ken-ichi Nomura¹, Pankaj Rajak¹, Rajiv K. Kalia¹ and Aiichiro Nakano¹; ¹University of Southern California, United States; ²Kumamoto University, Japan.

9:00 AM MB2.10.02

In Silico Study of the α - γ Phase Transformation of Hexahydro-1,3,5-Trinitro-1,3,5-Triazine (RDX) under Hydrostatic Loading Kartik Josyula, Rahul Mukherjee and Suvranu De; Rensselaer Polytechnic Institute, United States.

9:15 AM MB2.10.03

Hierarchical Multiscale Simulation—Scale-Bridging Applied to Taylor Anvil and Plate Impact Tests of RDX Brian Barnes, Kenneth Leiter, Jaroslav Knap and John K. Brennan; US Army Research Laboratory, United States.

9:30 AM MB2.10.04

Luminescent Dy(III) and Sm(III) Molecular Complexes as In Situ Temperature Sensors in Heterogeneous Materials under Shock Loading Hergen Eilers, Ray Gunawidjaja and Benjamin Anderson; Washington State University, United States.

9:45 AM MB2.10.05

Mechanical Deformation and Failure Mechanism of Methane Hydrate
Zeina Jendi, Phillip Servio and Alejandro Rey; McGill University, Canada.

10:00 AM BREAK

SESSION MB2.11/MB5.7: Joint Session: Mechanics of Nanoscale Materials

Session Chairs: Christopher Weinberger and Guang-Ping Zhang

Wednesday Morning, November 30, 2016

Sheraton, 2nd Floor, Constitution B

10:30 AM *MB2.11.01/MB5.7.01

Plasticity in Small-Scale Metallic Structures at Mechanical Extremes Amit Misra; University of Michigan, United States.

11:00 AM MB2.11.02/MB5.7.02

Mechanical Properties of Metal-Ceramic Nanolaminates—Effect of Constrain and Temperature Ling Wei Yang², Jon Molina-Aldareguia², Carl Mayer³, Nik Chawla³, Nan Li⁴, Nathan Mara⁴ and Javier Llorca¹; ¹IMDEA Materials Institute and Technical University of Madrid, Spain; ²IMDEA Materials Institute, Spain; ³Arizona State University, United States; ⁴Los Alamos National Laboratory, United States.

11:15 AM MB2.11.03/MB5.7.03

Strong, Ductile, and Thermally Stable Mg-Nb Nanolaminates Siddhartha Pathak¹, Marko Knezevic², Nenad Velisavljevic³, Manish Jain¹, Nathan Mara³ and Irene J. Beyerlein³; ¹University of Nevada, Reno, United States; ²University of New Hampshire, United States; ³Los Alamos National Laboratory, United States.

11:30 AM *MB2.11.04/MB5.7.04

Microstructure and Mechanical Behavior of HCP/BCC Nanolaminate Composites Produced by Physical Vapor Deposition and Accumulative Roll Bonding Nathan Mara¹, Daniel Savage^{2, 1}, John Carpenter¹, Siddhartha Pathak³, Rodney McCabe¹, Thomas J. Nizolek⁴, Nan Li¹, Sven Vogel¹, Marko Knezevic² and Irene J. Beyerlein^{1, 4}; ¹Los Alamos National Laboratory, United States; ²University of New Hampshire, United States; ³University of Nevada, Reno, United States; ⁴University of California, Santa Barbara, United States.

SESSION MB2.12: Damage Characterization

Session Chairs: Todd Hufnagel and Nathan Mara

Wednesday Afternoon, November 30, 2016

Sheraton, 2nd Floor, Constitution A

1:30 PM MB2.12.01

Multiscale 3D Imaging of Damage in an Angle-Interlocked Ceramic Matrix Composite under In Situ Mechanical Loading Using Laboratory X-Ray Microscopy Hrishikesh Bale¹, Leah Lavery¹, Robert O. Ritchie² and David Marshall³; ¹Carl Zeiss X-Ray Microscopy, United States; ²University of California, Berkeley, United States; ³Teledyne Scientific Co., United States.

1:45 PM MB2.12.02

X-Ray Phase-Contrast Imaging Studies of Crack Propagation in Ceramics During Dynamic Deformation Andrew F. Leong¹, Andrew K. Robinson¹, Kamel Fezzaa², Tao Sun², Brian Schuster³, Daniel T. Casem³, Paul K. Lambert¹, Kalit T. Ramesh¹ and Todd C. Hufnagel¹; ¹Johns Hopkins University, United States; ²Argonne National Laboratory, United States; ³Army Research Laboratory, United States.

2:00 PM MB2.12.03

Measurement of Shear Strength as a Function of Pressure for Orientated Mo Single Crystals David P. Field¹ and J. Pablo Escobedo-Diaz²; ¹Washington State University, United States; ²UNSW Canberra ADFA, Australia.

2:15 PM MB2.12.04

Revealing Three-Dimensional Nanoscale Grain Boundary Networks by APT and TEM Wei Guo¹, Yifei Meng², Xie Zhang³, Vikram Bedekar⁴, Hongbin Bei⁵, Scott Hyde⁴, Jian-Min Zuo² and Jonathan Poplawsky¹; ¹Oak Ridge National Laboratory, United States; ²University of Illinois at Urbana-Champaign, United States; ³Max-Planck-Institut für Eisenforschung GmbH, Germany; ⁴Timken World Headquarters, United States; ⁵Oak Ridge National Laboratory, United States.

2:30 PM BREAK

SESSION MB2.13: Fatigue/Corrosion

Session Chairs: Javier Llorca and Suveen Mathaudhu

Wednesday Afternoon, November 30, 2016

Sheraton, 2nd Floor, Constitution A

3:30 PM MB2.13.01

Strain Localization and Damage Development in a Polycrystalline Ni-Base Alloy in Low and Ultrahigh Cycle Fatigue Tresa Pollock, McLean Echlin and Jean Charles Stinville; University of California, Santa Barbara, United States.

3:45 PM MB2.13.02

Impact Fatigue Behavior of WC-Co/Ni Cemented Carbides Leslie Lamberson, Steven Pagano and Peter Jewell; Drexel University, United States.

4:00 PM MB2.13.03

History-Independent Fatigue Response of Nanotwinned Metals Governed by Correlated Necklace Dislocations Haofei Zhou and Huajian Gao; Brown University, United States.

4:15 PM MB2.13.04

Dislocation Patterning and Fracture Feature Matching in low Carbon Steel Fatigued in High Pressure Hydrogen Gas Environment Shuai Wang^{1, 4}, Akihide Nagao^{2, 3}, Ian M. Robertson^{4, 1, 3} and Petros Sofronis^{3, 5}; ¹University of Wisconsin-Madison, United States; ²Steel Research Laboratory, JFE Steel Corporation, Japan; ³Kyushu University, Japan; ⁴University of Wisconsin-Madison, United States; ⁵University of Illinois at Urbana-Champaign, United States.

4:30 PM MB2.13.05

Effect of 3D Crystallographic Orientation on Evolution of Corrosion in Aluminum Alloys Hrishikesh Bale¹, Tyler J. Stannard², Jeff Gelb¹, Erik M. Lauridsen³, Arno Merkle¹ and Nik Chawla²; ¹Carl Zeiss X-Ray Microscopy, United States; ²Arizona State University, United States; ³Xnovo Technology ApS, Denmark.

SESSION MB2.14: Phase Transformations

Session Chairs: Corinne Packard and Manuel Ramos

Thursday Morning, December 1, 2016

Sheraton, 2nd Floor, Constitution A

8:45 AM *MB2.14.01

Pressure-Induced Phase Transformation in Xenotime Rare-Earth Orthophosphates Matthew A. Musselman, Taylor M. Wilkinson and Corinne E. Packard; Colorado School of Mines, United States.

9:15 AM MB2.14.02

Formation of Hexagonal-Diamond from Glassy Carbon at Megabar Pressures Thomas Shiehl², Dougal G. McCulloch¹, Jodie E. Bradby², Bianca Haber¹, Reinhard Boehler³ and David McKenzie³; ¹RMIT University, Australia; ²Australian National University, Australia; ³University of Sydney, Australia; ⁴Oak Ridge National Laboratory, United States; ⁵Carnegie Institute of Washington, United States.

9:30 AM *MB2.14.03

Mechanical and Structural Properties in MoS₂ Thin Films Manuel A. Ramos^{1, 2}, Manuela Ortiz^{1, 2}, John Nogan², Jose Mireles-Garcia¹, Jose L. Enriquez-Carrejo¹ and Abel Huratdo Macias³; ¹Universidad Autónoma de Ciudad Juárez, Mexico; ²Center for Integrated Nanotechnologies, United States; ³Centro de Investigacion en Materiales Avanzados, Mexico.

10:00 AM BREAK

SESSION MB2.15: Irradiation Effects
Session Chairs: Emmanuelle Marquis and Yuntian Zhu
Thursday Morning, December 1, 2016
Sheraton, 2nd Floor, Constitution A

10:30 AM *MB2.15.01

In Situ Atomic-Scale Observation of Irradiation-Induced Void Formation and Growth Weizong Xu¹, Yongfeng Zhang², Paul Millett³ and Yuntian T. Zhu^{1,4}
⁴; ¹North Carolina State University, United States; ²Idaho National Laboratory, United States; ³University of Arkansas, United States; ⁴Nanjing University of Technology, China.

11:00 AM MB2.15.02

Two-Temperature Model Molecular Dynamics Simulations of Irradiation of Ni and Ni-Based Alloys Eva Zarkadoulas¹, German D. Samolyuk¹ and William J. Weber^{2,1}; ¹Oak Ridge National Laboratory, United States; ²University of Tennessee, United States.

11:15 AM MB2.15.03

Damage Tolerance of Nuclear Graphite at Elevated Temperatures—In Situ Damage and Fracture Studies Using Synchrotron X-Ray Computed Tomography Dong Liu¹, Bernd Gludovatz², Claire Acevedo², Harold Barnard², Martin Kuball³ and Robert O. Ritchie²; ¹University of Oxford, United Kingdom; ²Lawrence Berkeley National Laboratory, United States; ³University of Bristol, United Kingdom.

11:30 AM *MB2.15.04

Irradiation Condition and Dose Rate Effects in Irradiated Fe-Cr Alloys Elaina Anderson¹, Mukesh Bachhav¹, Lan Yao¹, Khalid Hattar³, G. Robert Odette² and Emmanuelle A. Marquis¹; ¹University of Michigan, United States; ²University of California, Santa Barbara, United States; ³Sandia National Laboratories, United States.

SESSION MB2.16: Mechanics at Small-Scales
Session Chairs: Peter Hosemann and Seok-Woo Lee
Thursday Afternoon, December 1, 2016
Sheraton, 2nd Floor, Constitution A

1:30 PM *MB2.16.01

Small Scale Mechanical Testing on Materials for Nuclear Applications Peter Hosemann, Ashley Reichardt, Hi Vo, Cameron Howard and Anya Prasithipayong; University of California, Berkeley, United States.

2:00 PM MB2.16.02

Cataloging Anomalous Nanoindentation Behaviors and Mechanical Properties in Rare-Earth Orthophosphate Ceramics Taylor M. Wilkinson, Dong Wu, Matthew A. Musselman and Corinne E. Packard; Colorado School of Mines, United States.

2:15 PM MB2.16.03

Quantitative In Situ TEM Mechanical Testing of Geological Materials Claire Chisholm, William M. Mook, Anastasia G. Ilgen and Katherine L. Jungjohann; Sandia National Laboratories, United States.

2:30 PM MB2.16.04

Micromechanics at the Extremes of Stress: the Effects of Orientation, Temperature and Doping on the Strength of Diamond Ming Chen and Jeff Wheeler; ETH Zurich, Switzerland.

2:45 PM MB2.16.05

Pushing the Envelope in Variable Temperature Nanoindentation—High and Cryogenic Temperature Measurements Marcello Conte², Nicholas Randall², Gaurav Mohanty³, Jakob Schwiedrzik³, Jeff Wheeler⁴, Johann Michler³, Bertrand Bellaton² and Pierre Morel¹; ¹Anton Paar USA, United States; ²Anton Paar TriTec, Switzerland; ³Laboratory for Mechanics of Materials and Nanostructures, Switzerland; ⁴ETH, Switzerland.

3:00 PM BREAK

SESSION MB2.17: Severe Plastic Deformation/High Pressures
Session Chairs: Maria Teresa Perez Prado, Mariana Prado and Ludovic Thilly
Thursday Afternoon, December 1, 2016
Sheraton, 2nd Floor, Constitution A

3:30 PM *MB2.17.01

Multi-Scale Cu/Nb Nanocomposite Wires Processed by Severe Plastic Deformation for High Pulsed Magnets—Assessing Size and Architecture Effects on the Resistance to High Stress Ludovic Thilly¹, Florence Lecouturier², Jean Rony Medy¹, Patrick Villechaise¹ and Pierre-Olivier Renault¹; ¹University of Poitiers-Pprime Institute, France; ²LNCMI, France.

4:00 PM MB2.17.02

The Influence of High Pressure Torsion on Magnetic Properties of Ferromagnetic 4-f Elements—Er and Ho Sergey V. Taskaev^{1,2,4}, Konstantin Skokov³, Vladimir Khovaylo⁴, Dmitriy Karpenkov¹, Maxim Ulyanov¹ and Dmitriy Bataev¹; ¹Chelyabinsk State University, Russian Federation; ²South Ural State University, Russian Federation; ³Technische Universität Darmstadt, Germany; ⁴National University of Science and Technology MISiS, Russian Federation.

4:15 PM *MB2.17.03

Tuning the Magnetic Properties of Metals by Severe Straining Maria Teresa Perez Prado¹, Carmen Cepeda-Jimenez¹, Juan-Ignacio Beltran¹, Antonio Hernando^{2,3}, Miguel A. Garcia^{3,4}, Felix Yndurain^{5,6} and Alex Zhilyaev⁷; ⁸; ¹IMDEA Materials Institute, Spain; ²Instituto de Magnetismo, Spain; ³Universidad Complutense, Spain; ⁴CSIC, Spain; ⁵Universidad Autónoma, Spain; ⁶Universidad Autónoma, Spain; ⁷Fundació CTM Centre Tecnològic, Spain; ⁸Institute for Metals Superplasticity Problems, Russian Federation.

4:45 PM MB2.17.04

Pressure-Driven, Steric-Controlled Redox Reactions in Transition Metal Organic Chalcogenides Hao Yan^{1,2}, Fan Yang^{1,2}, Ding Pan³, Jeremy Dahl^{1,2}, Peter R. Schreiner⁴, Giulia Galli³, Wendy Mao^{1,2}, Zhi-Xun Shen^{1,2} and Nick Melosh^{1,2}; ¹Stanford University, United States; ²SLAC National Accelerator Laboratory, United States; ³University of Chicago, United States; ⁴Justus-Liebig-University of Giessen, Germany.